

Star Auto Scanner

USER MANUAL

Version 1.0

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1 Introduction

Star auto scanner is the latest innovative automotive diagnostic product based on both automotive electronics and information technology.

1.1 Features & functions

Features

- OEM-level coverage for European/Asian vehicles
- Wide color touch screen menu for easy navigation
- Built-in printer for convenient data recording
- Multi-language support
- Multiple tasking support
- Full component activation
- Settings of adaptation values
- Read & Change ECU coding
- Coding of the new control modules
- Software update directly from the Internet



Fig. 1.1

Functions

- Paper Printout
- Internet update function
- Circuit diagram reference
- Live data and waveform display
- Educational Demo with projection
- Multiple language display function

Technical Parameter

- 128MB CF card
- Built-in USB port
- 7.4" color touch screen LCD
- I/O of main unit: standard serial port RS232
- 32-bit microprocessor with 60MHz frequency

1.2 Layout of Star Auto Scanner

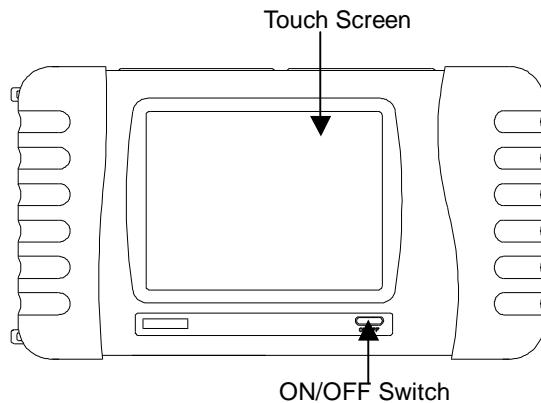


Fig.1.2

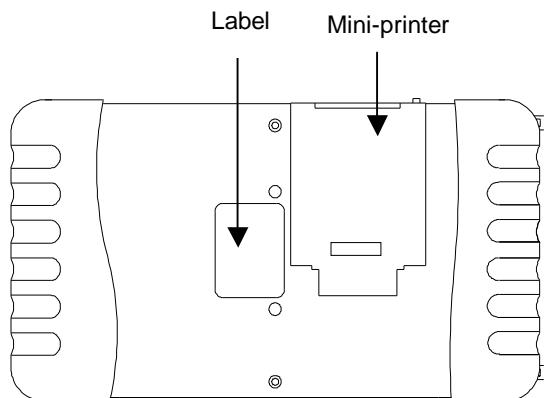


Fig.1.3

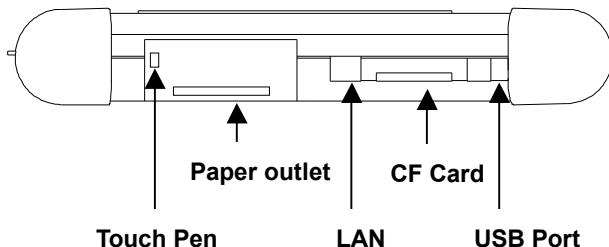


Fig.1.4

1.3 Diagnostic Connectors and Cables

Star auto scanner consists of a total of 9 diagnostic connectors and 4 cables, which can test the cars including BENZ, BMW, NISSAN, INFINITI, MITSUBISHI, HYUNDAI, TOYOTA, LEXUS, HONDA, ACURA, VW, AUDI and etc.

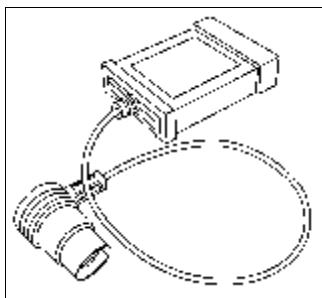


Fig.1.5

Name: BENZ-38 connector

Quantity: 1

Function: Connect to Mercedes-Benz vehicles equipped with a circular 38-pin diagnostic socket. Currently the BENZ-38 connector can be used on the following chassis: 202, 201, 208, 124, 210, 140, 126, 107, 129, 170, 463, and 461.

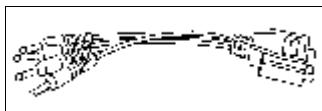


Fig.1.6

Name: BENZ-4 connector

Quantity: 1

Function: Connect to Mercedes-Benz vehicles before 1997 with flash codes. Those vehicles are usually equipped with either a rectangular 8-pin (as shown in Fig 3.4) or 16-pin (as shown in Fig 3.2) diagnostic socket.

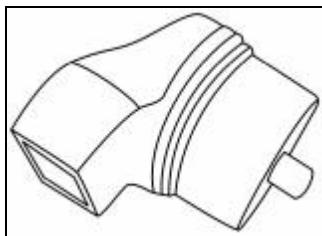


Fig.1.7

Name: BMW-20 connector

Quantity: 1

Function: Connect to BMW vehicles equipped with a 20-pin diagnostic socket.

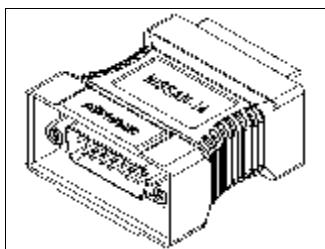


Fig.1.8

Name: NISSAN-14 connector

Quantity: 1

Function: Connect to Nissan and Infiniti vehicles equipped with a 14-pin diagnostic socket.



Fig.1.9

Name: MIT-12+16 connector

Quantity: 1

Function: Connect to Mitsubishi and Hyundai vehicles equipped with a 12-pin or 16-pin diagnostic socket.

NOTE: You should plug in both 12-pin head and 16-pin head if both diagnostic sockets are available on the vehicle.

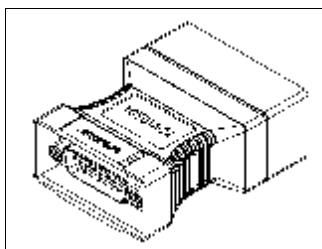


Fig.1.10

Name: TOYOTA-22 connector

Quantity: 1

Function: Connect to Toyota and Lexus vehicles with a rectangular 22-pin diagnostic socket.

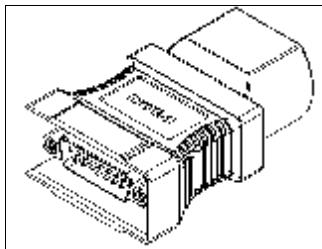


Fig.1.11

Name: TOYOTA-17 connector

Quantity: 1

Function: Connect to Toyota and Lexus vehicles with a semi-circular 17pin diagnostic socket.

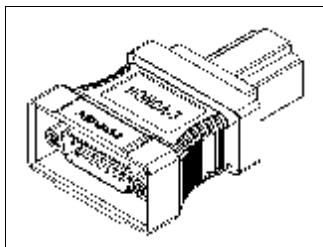


Fig.1.12

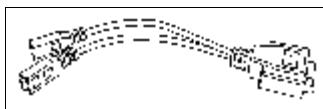
Name: HONDA-3 connector**Quantity:** 1**Function:** Connect to HONDA and ACURA vehicles with a 3-pin diagnostic socket.

Fig.1.13

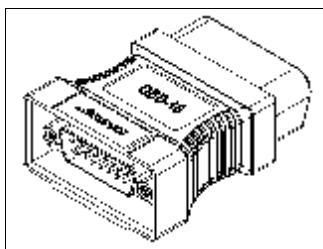
Name: AUDI-4 connector**Quantity:** 1**Function:** Connect to VW/AUDI vehicles with a 4-pin diagnostic socket.

Fig.1.14

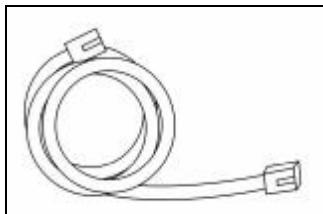
Name: OBD-16 connector**Quantity:** 1**Function:** Connect to all vehicles with a 16-pin diagnostic socket.

Fig.1.15

Name: Network cable**Quantity:** 1**Function:** Connect PC and **Star** for educational demo projection.

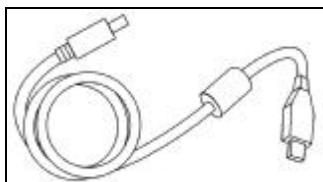


Fig.1.16

Name: USB cable**Quantity:** 1**Function:** Transfer data and download the software through Internet.

Fig.1.17

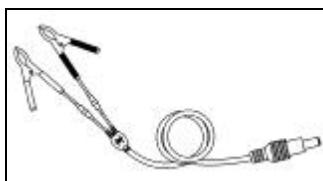
Name: Cigarette lighter cable**Quantity:** 1**Function:** Getting 12V DC power from the cigarette lighter on the vehicle when the voltage from diagnostic socket is insufficient or the connector is damaged.

Fig.1.18

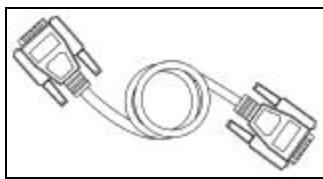
Name: Battery cable**Quantity:** 1**Function:** Getting 12V power from the battery of the vehicle when the voltage from diagnostic socket is insufficient or the connector is damaged.

Fig.1.19

Name: Main Cable**Quantity:** 1**Function:** Connecting the main unit and the diagnostic connectors when testing.

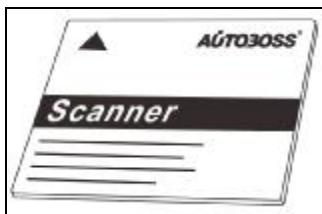
**Name:** CF card**Quantity:** 1**Function:** Storing software programs and data.

Fig.1.20

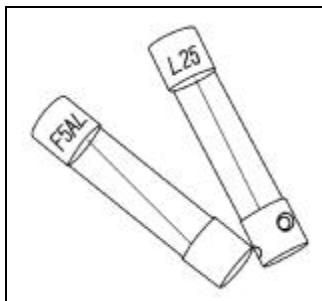
**Name:** Fuse 5A**Quantity:** 2**Function:** Spare parts for cigarette light cable.

Fig.1.21

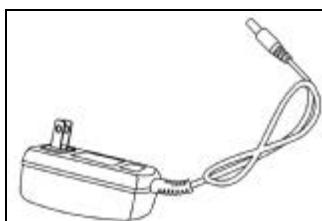
**Name:** DC Adaptor**Quantity:** 1**Function:** Providing power from AC-power socket when in house for updating the software, making the education demo projection, etc.

Fig.1.22

2 Operation methods

2.1 Precautions on operation

1. Try your best to keep the screen facing upward and leveled during the testing.
2. Be careful when plugging and unplugging the main cable and diagnostic connectors. Tighten the screw before operation so as to avoid unexpected disconnection and/or damage to the serial port.
3. Hold the **Star** Auto Scanner main unit during the operation. Avoid hitting or dropping the main unit on the ground. Turn off the power after operation.
4. Do not insert and pull out CF memory card too frequently. Insert the CF memory card into the CF memory card slot, keep the face labeled "Scanner" upward, and make sure the card is fully seated.
5. Hold the connector when plugging or unplugging to the scanner. Do not pull the cable when unplugging.

2.2 Adaptor connection

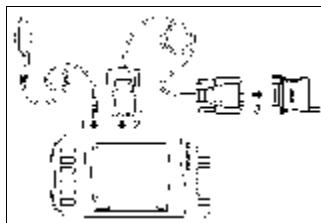


Fig.2.1

1. Connect the adaptor and **Star** auto scanner main unit with main test cable (i.e. steps 2 & 3 on Fig.2.1);
2. Plug the connector into vehicle diagnostic socket;
3. Connect the power adaptor if necessary (i.e. step 1 on Fig 2.1)

NOTE: A 12VDC voltage must be used, or it will damage the auto scanner.

2.3 Power Supply

Most **Star** auto scanner connectors can get power from the vehicle diagnostic socket directly (except for BENZ-4). If the voltage is insufficient or the power pin is damaged, you can get the power from the following ways:

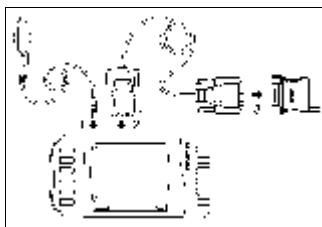


Fig.2.2

1. From cigarette lighter. Insert one end of the cigarette lighter cable into the lighter socket in vehicle and connect the other end to the power connector of **Star** main unit (see step 1 in Fig.2.2).

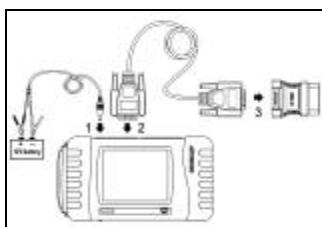


Fig.2.3

2. From vehicle battery. Clamp the two clips of battery cable on the positive and negative poles of battery and insert another end of the cable into the power port of **Star** main unit as shown in Fig.2.3.

3. From power adaptor. Connect the power adaptor to the 100-240V AC outlet with power cord. Insert the 12V DC plug of power adapter into the power connector of **Star** main unit.

NOTE: A universal 12VDC power adaptor can also be bought from the local market. However AUTOBOSS® does not recommend users to get power in this method.

2.4 Basic functions and operation flow

2.4.1 User Information

1. Function: Workshop Information

Star Auto Scanner prompts the user to input the workshop information. The user can record the user information including the name, telephone number, fax and address etc.

2. Path: Settings----User Information

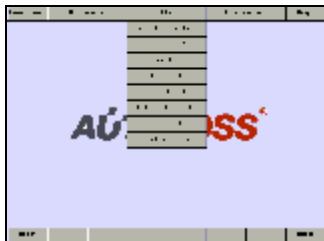


Fig. 2.4

Select **User Information** under **Settings** menu as shown in Fig.2.4.

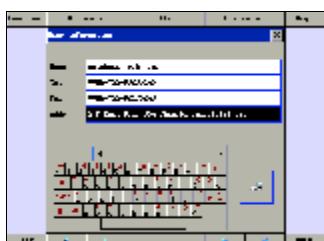


Fig. 2.5

The information can be input via the keyboard by selecting the keyboard icon under **Keyboard** menu. If incorrect information is entered, just click [←] to delete the incorrect character or number and input the correct one. If you want to enter Chinese characters, please press the button [中] first as shown in Fig.2.5.

2.4.2 Language

1. Function: Language Switchover

Star Auto Scanner is multilingual and currently supports both Chinese and English. The user can select either language as personal favorite.

2. Path: Settings----Language

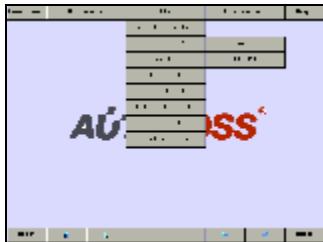


Fig.2.6

Select **Language** under **Settings** menu.

NOTE: Star has already set English as the default language. Press **language-> 中文** to switch into Chinese (Fig.2.6).

2.4.3 Display

1. Function: LCD display adjustment

The user can adjust the screen contrast or color by pressing the boxes.

2. Path: Settings----Contrast

AUTOBOSS® has already set the screen at the optimum contrast at the factory before delivery. Follow the procedures listed below if the screen is too white or too dark during the testing:

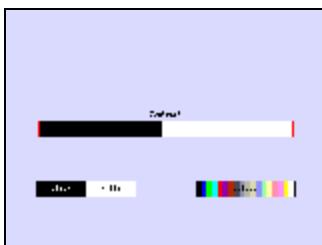


Fig2.7

- ① Select **Settings** from the main menu, and then select **Display**, the Fig 2.7 page will pop out;
- ② Adjust the optimum contrast with the touch pen and choose black/white or colour, the system will save the adjustment and return to the main menu automatically.

2.4.4 TouchSet

1. Function: Touch screen calibration
2. Path: Settings----TouchSet

NOTE: The screen has been calibrated at the factory before delivery. Do not touch the screen without purpose since it will affect the accuracy of the screen.

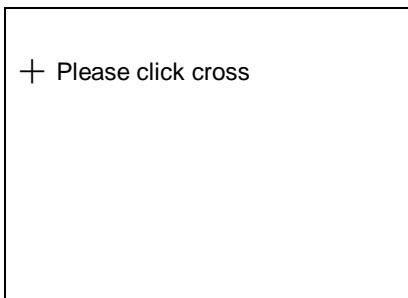


Fig 2.8

- ① Select **Settings** from the main menu, and then select **TouchSet**, the screen should be displayed as shown in Fig 2.8:

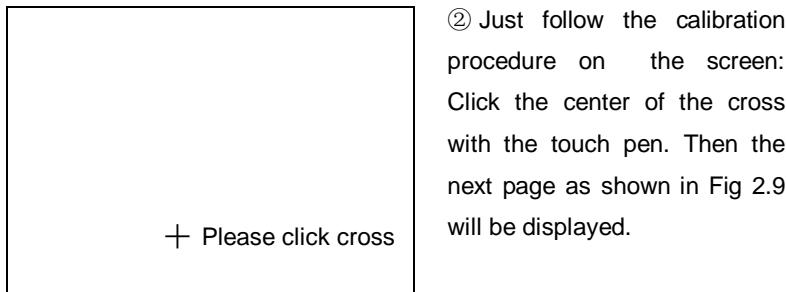


Fig 2.9

② Just follow the calibration procedure on the screen: Click the center of the cross with the touch pen. Then the next page as shown in Fig 2.9 will be displayed.

After clicking the cross the calibration is complete.

NOTE: Calibration can also be performed during the start-up of the scanner and the procedures are as follows:

- ① Turn off Star Auto Scanner first.
- ② Wait for more than 5 seconds and then turn on Star Auto Scanner.
- ③ Press the company logo "AUTOBOSS" with the touch pen for several seconds until the Fig. 2.8 is displayed, then just click on the center of the cross following the screen instruction.

Star Auto Scanner should return to the original configuration.

2.4.5 Projection

1. Function: Demonstration function for the current information transmitted to the PC via serial port.

The user can make education Demo anywhere at the mode of Projection.

2. Path: Settings---- Projection



Fig.2.10

① Download **educateddemo.exe** from AUTOBOSS® website:

www.autoboss.net to your PC and open it, you should receive three files as shown in Fig.2.10.

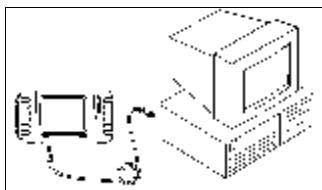


Fig.2.11

② Connect **Star** and PC with the network cable as shown in Fig. 2.11.

③ Manually Set the IP address of your computer between 192.168.1.2 and 192.168.1.253 **except** the following three one:

- 192.168.1.233
- 192.168.1.10
- 192.168.1.11

NOTE: the procedure of IP Address setting is as follow (e.g. windows XP operation system):

- a) Go to **Start menu**;
- b) Go to **Settings**;
- c) Select **Network Connections**;
- d) Click Local Area Network icon;
- e) Right click the PC mouse and select **Properties**;

- f) Go to General Tab and scroll down the window until you see **Internet Protocol (TCP/IP)**;
- g) Click on **Properties**;
- h) Select the ratio button use the above-mentioned IP address.



Fig.2.12

④ Select **Projection** under **Settings** on **Star** auto scanner and then run the file of **educatedemo.exe** on your PC and you should see the screen as shown in Fig 2.12. At the same time you should see a small icon on the most left bottom of **Star**.

⑤ Just operate on your **Star** auto scanner and stay in one interface, then click **Start** on PC. After this procedure, click the most left bottom icon on **Star** until the icon becomes red. The interface can be transferred to your PC screen. Click the **save** button on PC to capture the interface picture.

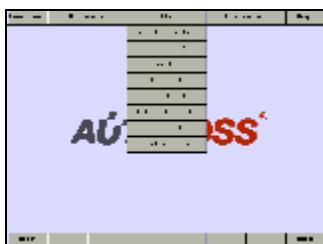


Fig.2.13

⑥ Click **Cancel Projection** under **Settings** menu to exit the PC projection mode (Fig. 2.13)

2.4.6 Internet update

1. Function: Convenient software update from the Internet
2. Path: **Settings**---- **Internet Update**

2.4.7 USB update

1. Function: Update the software via the USB mode
2. Path: **Settings**-----**USB Update**

NOTE: Only version 12.8 or above operating system can support this function.

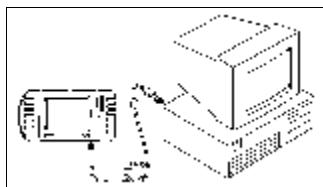


Fig.2.14

Connect **Star** and PC with the USB cable as shown in Fig.2.14. Select **USB Update** under **Settings** menu and the system should display "USB Card Reader Mode". Now the CF card information on **Star** can be read from the PC. Follow the procedures to

update the latest software at AUTOBOSS® website:
www.autoboss.net or call us at 0086-755-83285146, 83285370.

For detailed update operation flow please refer **chapter 4 update**

2.4.8 System Check

1. Function: Star Self-checking

Star auto scanner can automatically check whether the system is OK or not during Start up.

2. Path: Settings-----System check

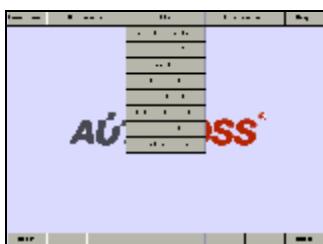


Fig.2.15

Select **System Check** from **Settings** menu, you should hear the checking sound from **Star** auto scanner. This sound indicates that the system is performing self-checking.

If there is any problem, the screen will display the error information.

2.4.9 Printer

1. Function: record the information when testing

Star auto scanner has one built-in mini printer, this mini printer makes the data recording very convenient and easy.

2. Path: functions-----



To print out the report on the screen, simply click the printer icon under **Functions** menu.

Fig.2.16

After the original paper is used up, replace a new paper roll under the following steps as illustrated in Fig. 2.17:

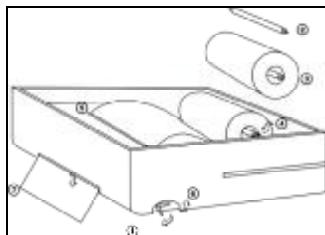


Fig.2.17

- ① Lift the switch;
- ② Take out the paper shaft;
- ③ Replace new paper roll into the paper shaft;
- ④ Secure the paper shaft into the bracket;
- ⑤ Roll out paper into the printer outlet;
- ⑥ Close the switch, than press the icon  to feed paper;
- ⑦ Tear out the paper clockwise with right hand.

2.4.10 Screen Turnover

1. Function: Turning the screen display 180°

Star provides the function of turning the screen display 180° .

2. Path: Functions----

The icon is located under **Functions** menu. If the original display orientation is not convenient for viewing during testing, just click this icon and the screen will turn upside down by 180° , re-click the icon and it will reset to original orientation.

2.4.11 Demo

1. Function: Demonstrate the operation without any adaptor and vehicle

2. Path: Functions----Demo

Demo button is located under **Functions** menu.

2.4.12 Actual value replay

1. Function: review the stored actual value

2. Path: Functions----

Refer Fig.2.16. The icon is the middle one under **Functions** menu.

2.4.13 Help

1. Function: Provide help information on Star auto scanner
2. Path: Functions----Help

2.4.14 Circuit

1. Function: Provide vehicle system circuit diagrams for reference
2. Path: Information---Circuit (Fig.2.18)



Fig.2.18

Star auto scanner provides demo circuit diagrams for Mercedes Benz E320, Select the folder as per the screen instructions.



Fig.2.19

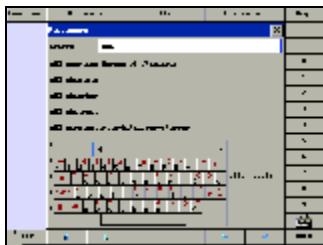
Select one circuit diagram and then click **OK** button on the bottom, the circuit diagram will be displayed on the LCD screen. Use [↑] [↓] [←] [→] button to move the circuit diagram, click **zoom** to magnify or enlarge, click **BACK** to re-select a new one (Fig.2.19).

2.4.15 Dictionary

1. Function: English words look-over

The users can search the dictionary for vehicle system abbreviation definitions.

2. Path: Information---Dictionary (Fig.2.20)



Enter the words via keyboard (read section [2.3.17 keyboard](#) if you cannot find the keyboard location). Press **Enter** button to retrieve explanations.

Fig.2.20

2.4.16 Keyboard

1. Function: Entry information

2. Path: Keyboard (the most right button of the bar, see Fig.2.21)



The function of Keyboard is the same as PC keyboard.

Fig.2.21

3 Vehicle diagnosis description

3.1 Mercedes Benz

3.1.1 Diagnostic socket location

1. The 16-pin trapezoidal diagnostic socket is located in the cab under the instrument cluster.
2. The 38-pin diagnostic socket is located in the engine compartment, passenger side, near the strut tower.
3. The 8-pin or 16-pin rectangular diagnostic socket is located in the engine compartment, near the firewall of the vehicle.

3.1.2 Pin definition

1. Pin definition for 16-pin OBD II diagnostic socket (Fig.3.1)

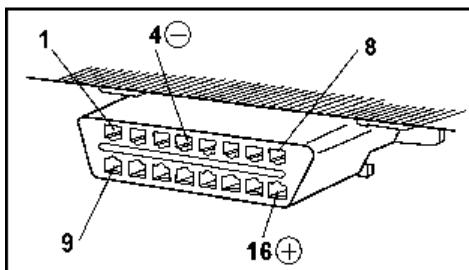


Fig.3.1

Pin	Definition	Pin	Definition
1	2-way communication line	9	2-way communication line
2	Not used	10	Not used
3	Not used	11	2-way communication line
4	Body ground	12	2-way communication line
5	Signal ground	13	2-way communication line
6	CAN interior bus (H)	14	CAN interior bus (L)
7	2-way communication	15	2-way communication line
8	Ignition signal	16	Battery voltage

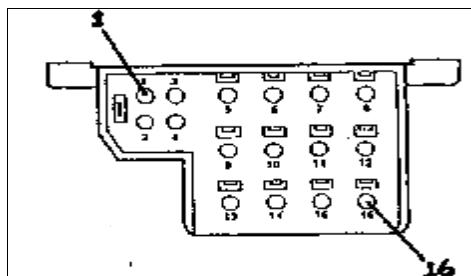
2. Pin definition for 16-pin rectangle diagnostic socket (Fig.3.2).

Fig.3.2

Pin	Definition	Pin	Definition
1	Body ground	9	ADS/RB(124)
2	On-board diagnostic switch	10	RST(129)/speed signal
3	CIS-E/DM	11	ATA
4	EDS/LED	12	IRCL
5	ASD	13	EATC
6	AB	14	EA(124)/ISC(124)/ESCM(129)/CC
7	AC(124)/RB(129)	15	Not used
8	DI/HFM,SFI,MFK/DMS	16	Positive pole of power

3. PIN definition for 38-pin diagnostic socket (Fig.3.3)

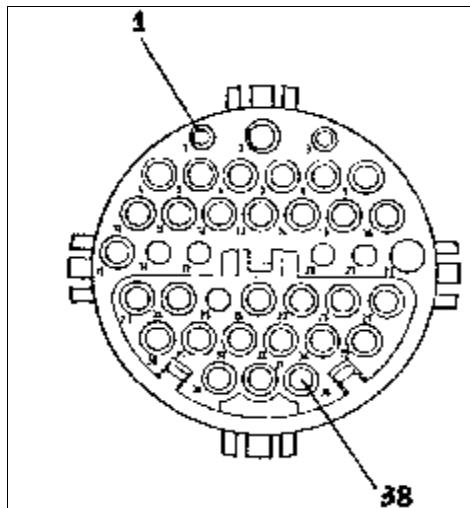


Fig.3.3

PIN	Definition	PIN	Definition
1	Body ground (or battery ground)	20	CLS, PSE
2	Ignition signal	21	Additional equipment (slide roof control)
3	Power	22	Additional equipment (rollover bar control module)
4	ENG ECU (M120 right), IGN ECU, diesel ENG ECU	23	EDW
5	LH engine ECU (M120 left)	24	Not used
6	ABS/ASR	25	Not used

7	Electronic throttle/CC/Idle Control	26	Not used; ASD
8	Comprehensive ECU	27	Not used
9	ASD	28	Not used
10	Auto transmission	29	Not used
11	ADS	30	SRS; AB/ETR
12	PML, SPS	31	Infrared door lock
13	Not used; RPM signal (LH & HFM-direct ignition)	32	Not used
14	Not used; Percentage diagnosis (LH-right)	33	Travel ECU; Not used
15	Not used; Percentage diagnosis (LH-left)	34	Not used
16	A/C	35	Not used
17	EZL (M120 right), TD signal (HFM&140);RPM signal (LH)	36	Assistant Heater
18	EZL (M120 left)	37	Not used
19	CARB. DM	38	Not used

4. PIN definition for 8-pin rectangle diagnostic socket (Fig.3.4).

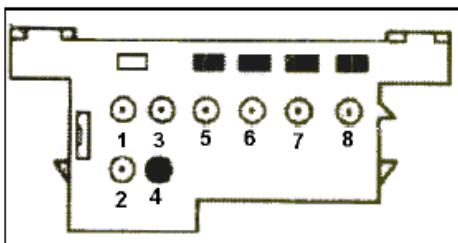


Fig.3.4

Pin	Definition	Pin	Definition
1	Body ground	5	ASD
2	Ignition signal /Press button	6	SUS trouble code
3	Diagnosis percentage	7	A/C trouble code
4	Engine trouble code /LED	8	Ignition control system

3.1.3 Select Diagnostic Adaptor

1. For vehicles before 1997 or equipped with 8-pin or 16-pin rectangular diagnostic socket, select BENZ-4 connector (i.e. Fig.1.6);
2. For vehicles with 38-pin diagnostic socket such as chassis 202, 201, 208, 124, 210, 140, 126, 107, 129, 170, 463, 461, please select BENZ-38 connector (i.e. Fig.1.5);
3. For new vehicles with only 16-pin diagnostic socket such as chassis 168, 169, 209, 211, 219, 221, 220, 215, 240, 230, 199, 171, 170, 164, 163, 251, 245, 463, 461, please use the OBD-16 connector (i.e. Fig.1.14).

NOTE: for connecting information please refer to section [2.2 adaptor connections](#).

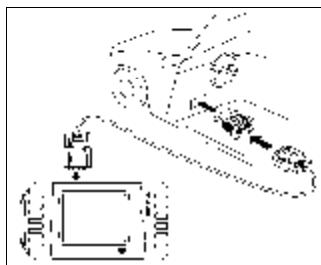
3.1.4 Testing power supply

All BENZ connectors can get power from the vehicle diagnostic socket directly except for BENZ-4. For BENZ-4, either cigarette lighter or the battery adaptor must be used to obtain 12VDC power to the scanner. For detail information and the connecting methods, please refer to section [2.3 Power supply](#).

3.1.5 Test procedure

Path: Diagnosis-----Auto Scanner (Fig.3.6)

NOTE: Now we take a 2004 Mercedes-Benz C180 Kompressor Sedan in the United States as an example to explain the diagnosis steps. There are many models and systems for Mercedes-Benz. It is not possible and not necessary to list the test steps for all of the models and systems. The test procedures for different models and systems are similar.



1. Choose OBD II adaptor and connect the main test cable as shown in Fig.3.5.

Fig.3.5



Fig.3.6

2. After the connection, turn on the power to start the **Star** auto scanner.
3. Select **Auto Scanner** from **Diagnostic** menu, you will get the interface as shown in Fig. 3.7



Fig.3.7

4. Select Mercedes Benz icon to enter the MB system as shown in Fig. 3.8.

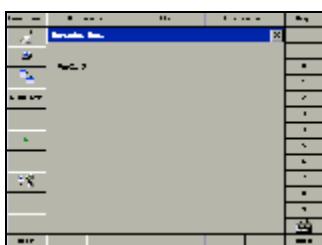


Fig.3.8

5. Select software version e.g. **V21.9** from the menu to enter mode/chassis type selection as shown in Fig.3.9.

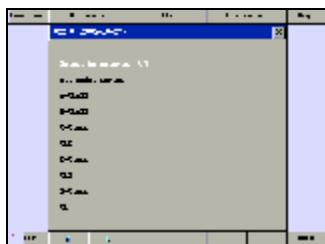


Fig.3.9

6. ① Select **All model series** to enter chassis type selection as shown in Fig.3.10.

② You can also select **C-class** to enter interface as shown in Fig.3.11.



Fig.3.10

7. Select **203** as shown in Fig. 3.10 or Fig. 3.11 to enter interface as shown in Fig.3.12. For information about how to determine the correct chassis number, please refer to Mercedes-Benz diagnostic procedure.

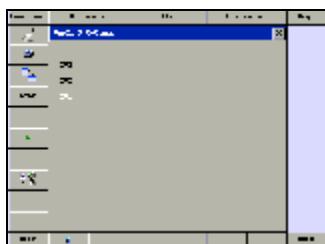


Fig.3.11

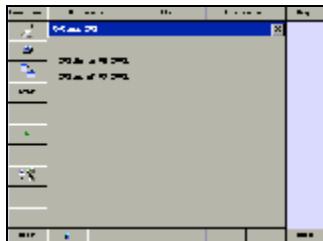


Fig.3.12

8. Select **203 (as of 09/2003)** as shown in Fig.3.12.



Fig.3.13

9. Select **Sedan** as shown in Fig.3.13.

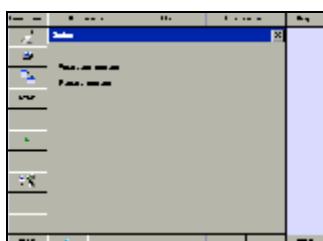


Fig.3.14

10. Select **Gasoline engine** as shown in Fig. 3.14

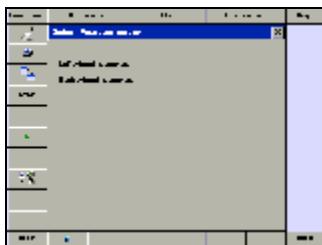


Fig.3.15

11. Select **Left-hand steering** as shown in Fig.3.15.

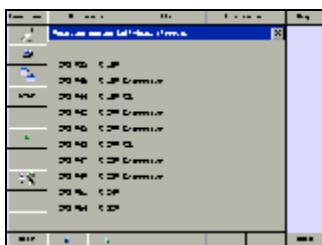


Fig.3.16

12. Select **203.046 C 180 Kompressor** as shown in Fig.3.16.

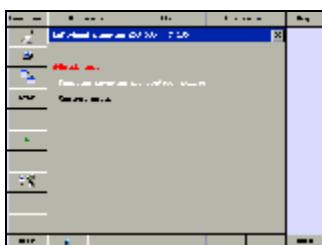


Fig.3.17

13. Select **Control units** as shown in Fig.3.17

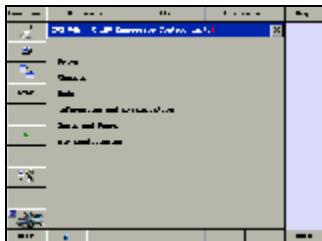


Fig.3.18

14. Select **Drive** to enter the interface as shown in Fig.3.19.



Fig.3.19

15. Select **Transmission** and wait for several seconds for file loading and vehicle communication.

NOTE: If **Demo** mode is used, the data can only serve as demo purpose and may not be correct.

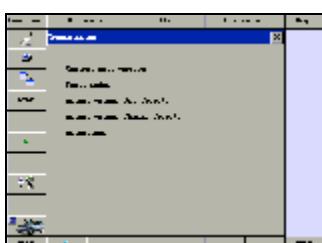


Fig.3.20

16. Select either **Control unit version**, **Fault codes**, **Actual values (All select)**, **Actual values (Manual Select)** or **Actuations** as shown in Fig. 3.20. Here we select **Actual values (All select)** to explain the self-study and actual value review as shown in Fig. 3.21.

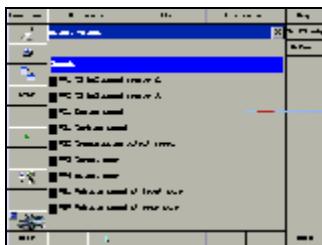


Fig.3.21

17. In this interface you will see all actual values listed, also there are a **Self Learn** button and a **Default** button in the right bar under the **Keyboard** menu.

Click the button **Self Learn** and a small window should pop up and ask: **Self-Learn Start?** Press **OK** to enter self-Learn system or **Cancel** to exit.

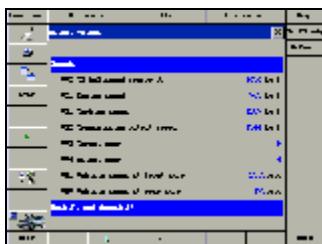


Fig.3.22

18. The system default selects all of the items, click on the black box for the items, which you do not want to study. The box should become white and it means the item will be skipped during Learning.

Press **OK** in the bottom to begin the study, Press [↓] to study more. And the max value and the min value will be recorded in the right bar (press **Default** to switch-over).

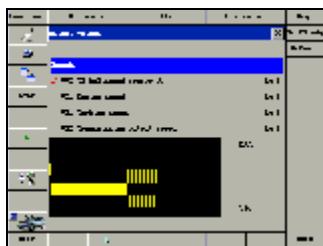


Fig.3.23

19. **Star** will store the actual values studied. You can review it when you test the vehicle next time.

If the value is red during studying, this means the system derivates from the operating max/min values from Self Learn. Just click the actual value replay icon to review the value.

Star auto scanner can replay up to 160-frame actual value.

The actual value also can be displayed as a waveform, please click **Wave** in the bottom to enter the wave display as shown in Fig.3.23.

Click the button **Self Learn** for the second time, the system will ask: **Clear Learned data?** As shown in Fig.3.24. Press **OK** to clear the first time learned data and record new data, press **Cancel** to exit learning.

20. Click **BACK** to return to the previous screen, press **X** (at the top right corner of the window) to close the testing.

NOTE: If you enter **Quick test** mode in Fig.3.17 interface, **Star** system will perform Quick test of the entire vehicle system (see Fig.3.25).

The followings explain the status of the **Quick test** results:

-F- means that there is fault code(s) in the system;

-!- means that the vehicle is not equipped with the system being tested;

- ✓ - means the system is OK.



Fig.3.25

Press **Quick Delete** in the bottom to delete the fault code(s) on all vehicle systems.

Select the system with DTC(s) to read the DTC(s) and the description (s),

Press **BACK** to connect to control unit testing; press **X** to end the quick testing.

3.2 BMW

3.2.1 Diagnostic socket location



Fig. 3.26
Diagnostic socket

1. BMW 20-pin diagnostic socket location

① For the BMWs of model year 80s-90s, the diagnostic socket is at the right side in the engine compartment as shown in Fig. 3.26.

- ② The diagnostic socket for 525i and 535i is at the left or right side in the engine compartment..
- ③ The diagnostic socket for 325, 635i and 735i is located in the cab under the instrument.

2. BMW-16PIN diagnostic socket location:

BMW 16-pin diagnostic socket is located in the cab under the instrument cluster at the left side. See Fig.3.28 for its outline.

3.2.2 Pin definition

1. Pin definition for 20-pin diagnostic socket (Fig. 3.27)

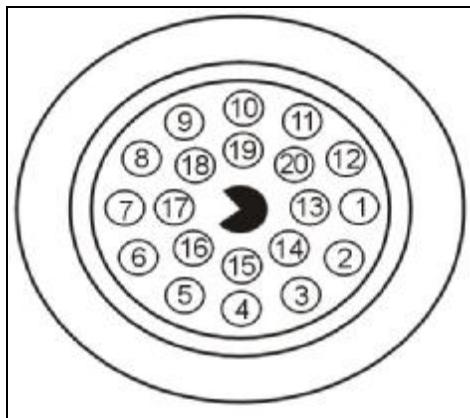


Fig.3.27

Pin	Definition	Pin	Definition
1	Not used	11	Starting signal
2	Not used	12	Alternator D+ control
3	Not used	13	Not used
4	Not used	14	Permanent power supply
5	Not used	15	Diagnostic information line RxD
6	Not used	16	Ignition operation 15 and Starting
7	Service reset	17	Diagnostic information line
8	Not used	18	Input line for DME ECU software modification.
9	Not used	19	Body ground
10	Not used	20	Diagnostic information TxD

2. Pin definition for 16-pin diagnostic socket (Fig.3.28)

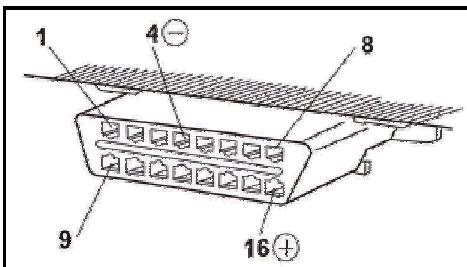


Fig.3.28

Pin	Definition	Pin	Definition
1	Not used	9	Not used
2	J1850 BUS+	10	J1850 BUS-
3	Not used	11	Not used
4	Body ground	12	Not used
5	Signal ground	13	Not used
6	Not used	14	Not used
7	ISO9141 K line	15	ISO9141 L line
8	Not used	16	Battery voltage

3.2.3 Select Diagnostic Adaptor

Select the **BMW-20** connector for the vehicle with a 20-pin diagnostic socket and select **OBD-16** connector for the vehicle with a 16-pin diagnostic socket.

3.2.4 Testing power supply

Both 16-pin and 20-pin BMW connectors can get power from the vehicle diagnostic socket directly. If the voltage is insufficient or the power pin is damaged, please refer to section [2.3 Power supply](#) for detailed information and the connection methods.

3.2.5 Test procedure

Path: Diagnostic-----Auto Scanner (Fig.3.29)

Example: 2005 BMW 118i

Button explanations:

[↑] page up; [↓] page down; [Back] return to the front interface;

[×] close the window/exit; [Ok] confirm;

[←] move the page to left; [→] move the page to right.



1. Select **Auto Scanner** from **Diagnostic** Menu (see Fig.3.29), you will get the interface as shown in Fig.3.30.

Fig.3.29



Fig.3.30

2. Select **BMW** to enter the Software version you like to use, you will get interface as shown in Fig.3.31.

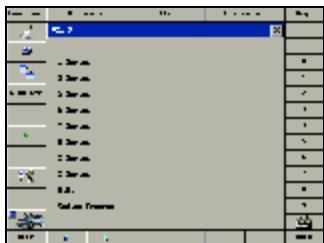


Fig.3.31

3. Select car model **1 series** (see Fig.3.31).

NOTE: The function of **Coding** /Program is to read the coding and recoding the ECU.

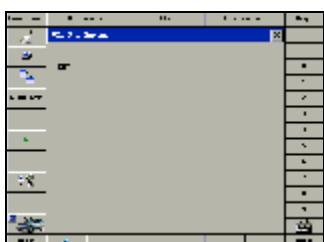


Fig.3.32

4. Select engine model **E87** (see Fig.3.32).

NOTE: you can read APPENDIX 7.2
BMW body code chart for the body
code determining.

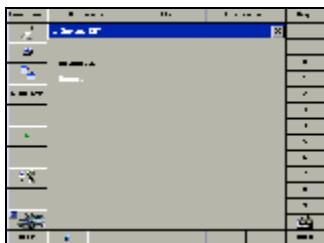


Fig.3.33

5. Select **Automatic** or **Manual** (see Fig.3.33). **Automatic** means the vehicle systems will be automatically detected by Star system while **Manual** means the user will input the vehicle information.

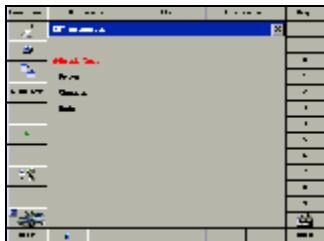


Fig.3.34

6. Select test mode. **Quick test** will quickly scan all of the vehicle systems. If you do not like to scan all of the systems, select the particular module (**Drive**, **Chassis** or **Body**) you want to test.

For example, select **Drive** to enter the interface as shown in Fig.3.35.

NOTE: In the end of normal test we will explain the **Quick test** procedure.

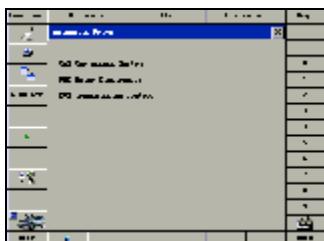


Fig.3.35

7. Select **CAS Car Access System** and you will see the interface as shown in Fig.3.36.

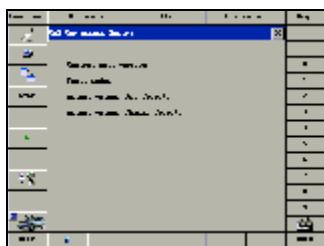


Fig.3.36

8. Select **Control unit version** to retrieve the information about the control unit such as **Part number**, **Coding index**, **Date of manufacture**, **Diagnosis index**, **Hardware number**, etc.

Select **Fault codes** to read and erase fault memory.

Select either **Actual values (all select)** or **Actual values (Manual Select)** to retrieve the real-time data stream (see Fig.3.36).

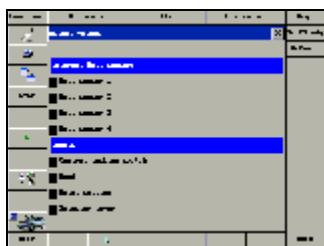


Fig.3.37

9. Press **Self Learn->OK** to learn the actual value(s).

Press ↓ to learn more actual value(s) (see Fig.3.37).

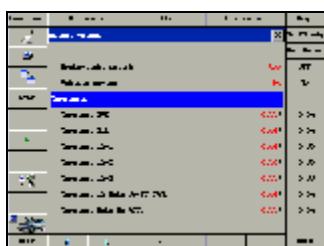


Fig.3.38

Star auto scanner will store the learned value automatically and record the learned range in the left bar.

Click **Max** to read the maximum; click **Min** to read the minimum (see Fig.3.38).

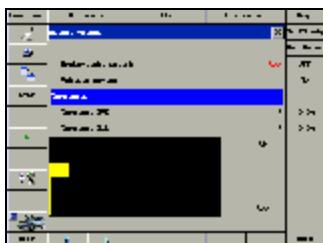


Fig.3.39

Click **Wave** in the bottom to display the actual value as a waveform (see Fig.3.39).

Click **BACK** to return to the learning interface.

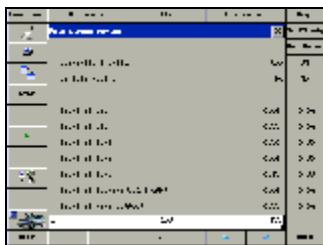


Fig.3.40

Star will display the value in red if the system is abnormal. Click to review the data stream and find out the abnormal ones.

Star can replay up to 160 frames data stream per time. Click and to read every frame.

Click to print out the result.

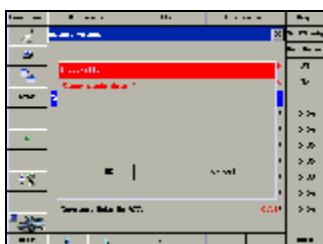


Fig.3.41

10. Click **Self Learn** to clean the learned actual values and begin to new learn.

Click to exit.

Quick test procedure:

1. See Fig.3.34. Select **Quick test** to enter quick test mode.

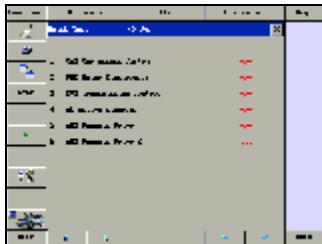


Fig.3.42

Wait several minutes for file loading and vehicle communication. After the testing is complete, there will be a red character following every system to indicate the testing results. For example:

- F- means that there is a DTC(s) in the system;
- !- means that there is no such system in the car;
- ✓- means that the system is ok.

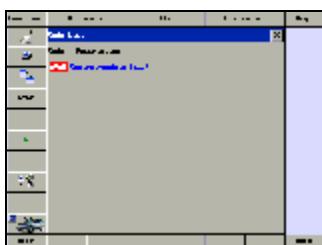


Fig.3.43

2. ① Click **CAS Car Access System** to read the DTC(s) and the Description(s) (See Fig.3.43).



Fig.3.44

Click **BACK**, a window will pop up to ask you '**Connect Control Unit?**' (See Fig.3.44).

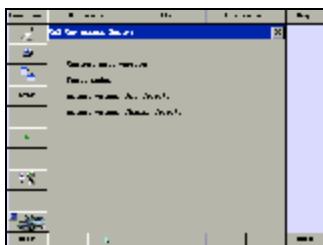


Fig.3.45

Choose **OK** to enter the control unit testing (see Fig.3.45).

Select **Cancel** to return to **Quick test** result interface.

The operating procedure is the same as choose **Drive->CAS Car Access System** in normal test mode.



Fig.3.46

②Click **Quick delete** to delete the DTC(s) on all the vehicle system(s) (see Fig.3.46).

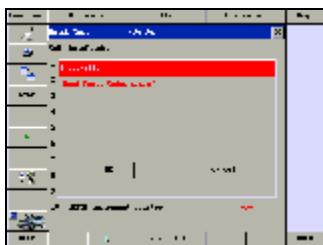


Fig.3.47

Click **BACK** to re-read the DTC (see Fig.3.47).

Click **X** to exit.

NOTE: The values or DTCs in the example are from Simulate mode, which only serve as demonstration purposes. For the actual data please refer to the real testing.

4 Software Update

Star auto scanner software update normally is via Internet. This is very convenient for customers to obtain the latest diagnostic program(s) and keep pace with the development of new features and functions. The following instructions will illustrate how to update the **Star** scanner. It is as easy as 1, 2, 3...

4.1 Precautions

1. Install the CF card into the main unit correctly;
2. Ensure the proper cable connection and stable power supply. Avoid the CF card being damaged or slow update speed due to power breakdown or the harness connection;
3. Do not touch the PC and main unit during the software update;
4. Check the CF card after the software update. Repeat the diagnostic program download and update or contact your local dealer for assistance if the screen does not display properly;
5. **Backup CF card to PC computer for security.**

4.2 Hardware Requirements

1. Desktop or Laptop PC with operating systems Windows 98/2000/XP;
2. **Star** main unit and CF card;
3. USB Cable and 12V AC/DC adaptor;
4. Internet access to website: <http://www.autoboss.net> .

4.3 Update flow

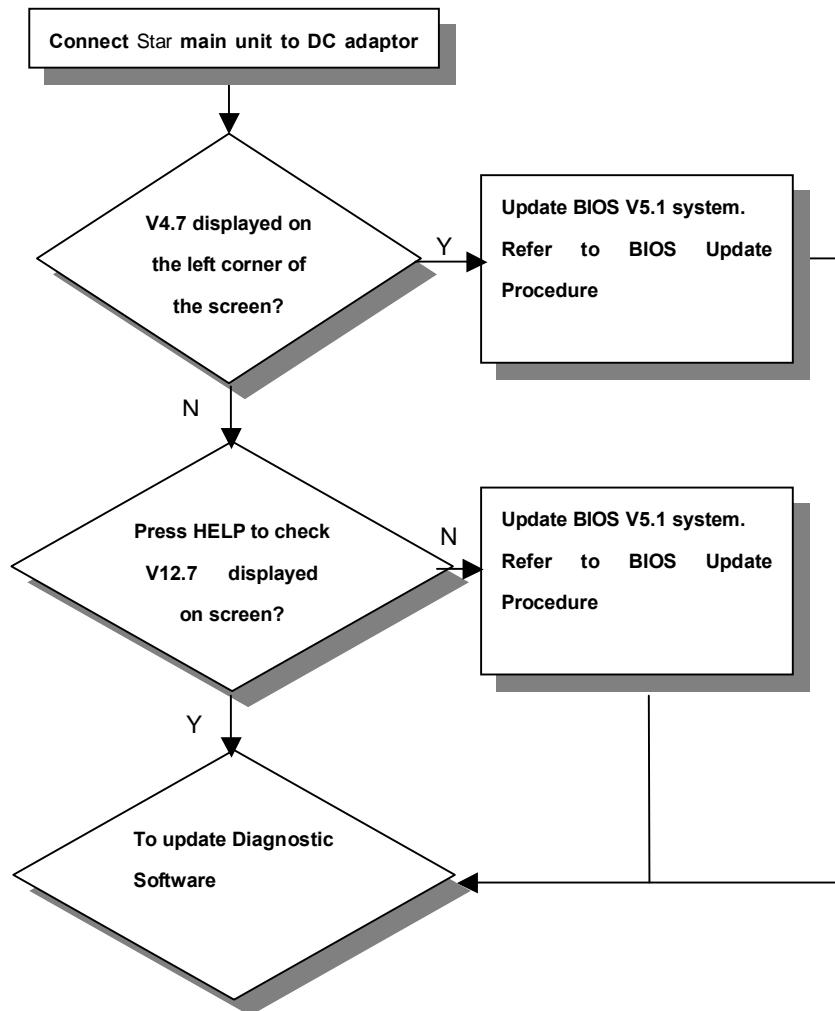


Fig.4.1

4.3.1 Bios update

1. Backup CF card to PC computer for security.

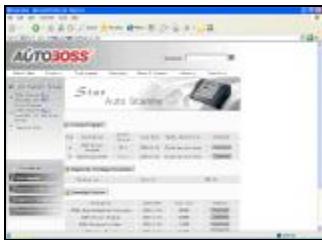


Fig.4.2

2. Go to AUTOBOSS® website: www.autoboss.net to download **BIOS System Program** and **Operating System** to the desktop of your PC computer.

3. Connect **Star** main unit to the PC correctly with **USB cable** and **DC adaptor**.
4. Turn on the power by pressing the button **[ON/OFF]**.



Fig.4.3

5. Access the **USB update mode** from the menu **Setting--USB Update** (see Fig.4.3).

NOTE: For BIOS 4.7: The screen will display "Updating via the USB? Press any where point for USB Card Reader." Touch anywhere of the screen to access the USB update mode.



Fig.4.4

6. The removable disc **AUTOBOSS** will be displayed as shown in Fig.4.4

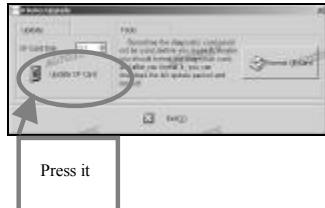


Fig.4.5

7. Double click the icon



`bios-V5.1-051123-en.exe` and Fig.4.5
will pop up.

8. Press the button **Update CF Card**.



Fig.4.6

9. The information **Upgrade Succeed!** will be displayed on the top of the screen shown as shown in Fig.4.6

10. Press the button **Exit [X]** first and then safely remove USB Mass

Storage Drive – Drive.

11. Turn off the power by pressing the button [ON/OFF]
12. After three seconds later, turn on the power to refresh the bios operating system.

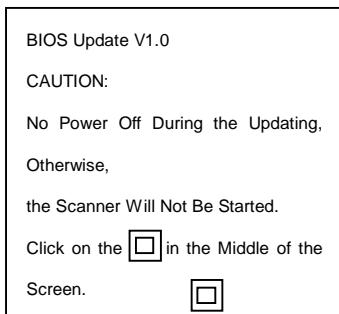


Fig.4.7

13. The information **Upgrade Succeed!** will be displayed on the top of the screen shown as Fig.4.6 shown

14. The following page will be displayed after several seconds later:
15. Touch the center of the by the touch pen provided.

NOTE: Press the center of the with the touch pen.

Turn off the power and repeat the Step 11, 12, 13 and 14 when the information is displayed: “----**Clicking Error, Operation Abort**----”.

16. The information “**BIOS Update Completed**” will be displayed if the bios update is successful.
17. Turn off the power. Three seconds later, turn on the power and press the **USB icon immediately** to access **USB update mode**.



Fig.4.8

18. Double click the icon



OS-V12.7-051123.exe to run the file

OS-V12.7-051123.exe, and press button **Format CF Card**. The Fig.4.8 page will be displayed:

19. Press the button **Yes** to format the CF card.



Fig.4.9

20. Several seconds later, the formatting of the CF card is complete and the Fig.4.9 page will be displayed.

21. Press the button **OK** first and then copies the backup software (see **Step 1**) to CF card.
22. Then press the button **Update CF Card** again to update software, wait until you see **Upgrade Succeed!** in window title.
23. Press the button **Exit [X]** first and then safely remove USB Mass Storage Drive –Drive.
24. Turn off the power. Wait 3 seconds and then turn on the power to refresh the system.

4.3.2 Operation system (OS) update

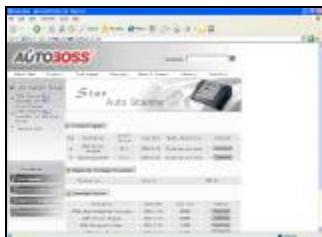


Fig.4.10

1. Login www.autoboss.net and download the operating system



OS-V12.7-051123.exe to the desktop of your computer.

2. Connect **Star** main unit to PC correctly with **USB cable** and **DC adaptor**.
3. Turn on the power by pressing the button **[ON/OFF]**.



Fig.4.11

4. Access the **USB update mode** from the menu **Settings--USB Update**.

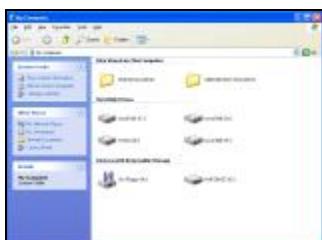


Fig.4.12

5. The removable disc AUTOBOSS will be displayed as Fig.4.12.

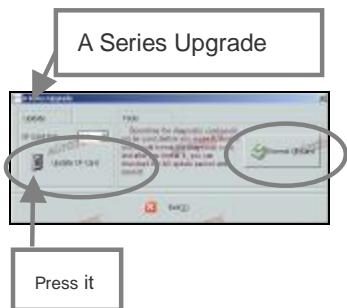


Fig.4.13



6. Press the button **Update CF Card**.

7. The information **Upgrade Succeed!** will be displayed on the top of the screen as shown in Fig.4.14.

Fig.4.14

8. Press the button **Exit [X]** first and then safely remove USB Mass Storage Drive – Drive.
9. Turn off the power by pressing the button **[ON/OFF]**.
10. Wait three seconds and then turn on the power to refresh the system.

4.3.3 Diagnostic program update



Fig.4.15

1. Login www.autoboss.net and download the diagnostic software program to the desktop of your computer. For example, download



mitsubishi-V17.1-V22.0-051123.exe from the **Diagnostic Package Download**.

2. Connect **Star** main unit to PC correctly with **USB cable** and **DC adaptor**
3. Turn on the power by pressing the button **[ON/OFF]**.



Fig.4.16

4. Access the **USB update mode** from the menu **Settings**—>**USB Update**.



Fig.4.17

5. The removable disc **AUTOBOSS** will be displayed as Fig.4.17 shown.

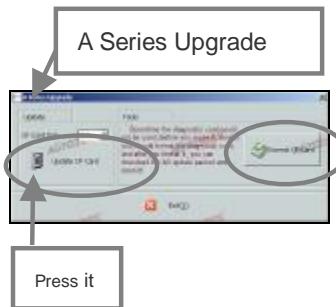


Fig. 4.18

6. Double click the icon



mitsubishi-V17.1-V22.0-051123.exe and Fig. 4.18 will pop up.

7. Press the button **Update CF Card**.



Fig. 4.19

8. The information **Upgrade Succeed!** will be displayed on the top of the screen shown as below:

9. Press the button **Exit [X]** first and then safely remove USB Mass Storage Drive – Drive.
10. Turn off the power by pressing the button **[ON/OFF]**.
11. After three seconds later, turn on the power to refresh the system for a new trial.

NOTE: For detailed version and relevant information of the update software, please browse www.autoboss.net or call 0086-755-83285146, 83285370 or fax 0086-755-82170248.

AUTOBOSS may revise the information without any other notice.

5 Warranty

THIS WARRANTY IS EXPRESSLY LIMITED TO PERSONS WHO PURCHASE AUTOBOSS PRODUCTS FOR PURPOSES OF RESALE OR USE IN THE ORDINARY COURSE OF THE BUYER'S BUSINESS.

AUTOBOSS electronic product is warranted against defects in materials and workmanship for two years (24 months) from date of delivery to the user. This warranty does not cover any part that has been abused, altered, used for a purpose other than for which it was intended, or used in a manner inconsistent with instructions from the manual. The exclusive remedy for any product found to be defective is repair or replacement, and AUTOBOSS shall not be liable for any consequential or incidental damages. Final determination of defects shall be made by AUTOBOSS in accordance with procedures established by AUTOBOSS. No agent, employee, or representative of AUTOBOSS has any authority to bind AUTOBOSS to any affirmation, representation, or warranty concerning AUTOBOSS product, except as stated herein.

6 FAQ

Star Auto Scanner is a hi-tech product. With the rapid development of modern automotive industry, more and more new technology will be adopted and there may be questions during operation. Read the user's manual to get the answers whenever you have any questions, or contact our Customer Service Center or local dealers for assistance.

Here we list some frequently asked questions and answers relating to **Star** Auto Scanner.

6.1 Maintenance

Question: how to extend the life of Star auto scanner?

Answer: Pay attention to the followings during operation:

1. Store **Star** Auto Scanner on a flat and dry place at room temperature.
2. Never place **Star** Auto Scanner in direct sunlight or near the heating source.
3. Prevent smoke, water and oil from entering **Star** Auto Scanner.
4. Avoid shock, dust, moisture and heat.
5. Do not disassemble the main unit. Clean the outside surface and screen with soft cloth when the machine is turned off and the power cable is removed.
6. Periodically turn on **Star** Auto Scanner main unit if it is not operated for long time to avoid moisture buildup.
7. Do not place any object on the main unit to avoid damage to the internal components.
8. Use the equipped stylus to click the touch screen LCD. Do not use fingernail or other sharp object to touch the screen.

9. Dust may be accumulated on the LCD screen owing to the electrostatics. Use a special LCD screen wiper to clean the screen gently. Do not wipe the screen with bare finger.
10. Never use any chemicals to clean the screen.
11. Turn off the power if it is expected not to operate **Star** Auto Scanner for a long time. It can extend the life of screen.

6.2 About software update

1. Question: Why the main unit cannot recognize the replaced CF card?

Answer: There are two possible reasons:

- ① The files on the original 128MB CF card has not been fully copied.
Please delete the incomplete file(s) and copy again.
- ② The new CF card is not compatible with Star scanner.
Mono-functional CF card is better in such situation.

2. Question: How to make a new Star CF card when the data in old one is lost or damaged?

Answer: In case **Star** CF card is damaged and the program(s) in the card cannot be read, please follow the listed procedures to make a new CF card:

- ① Purchase the same compatible CF card from the market.
- ② Format **Star** CF card.
- ③ Download the software program(s) from AUTOBOSS® website.
- ④ Connect **Star** Auto Scanner and PC through with the USB cable for software update.

6.3 About hardware

1. Question: Why does the saved data disappear?

Answer: Your CF card is damaged.

2. Question: The LCD screen does not respond or responds incorrectly when I click it with a pen. What should I do?

Answer: It is necessary to calibrate the screen. Please refer to the section “TouchSet” in the User’s Manual.

3. Question: What can I do when the screen is confused?

Answer: Please exit the current interface and run it again. If the problem still exists, restart the system.

4. Question: Why I cannot operate in current interface?

Answer: There are two possible reasons:

- ① Your current interface has exited illegally. In this situation, you may not see the name of the application (interface) in the pop-up list when you click the active taskbar icon.
- ② The system is busy, please wait patiently, or click the active taskbar icon to switch to another application.

5. Question: Why does the LCD screen respond so slowly?

Answer: It is because the ambient temperature is close to the lower limit of operating temperature range (0~50 °C). In this situation, it is necessary to warm up the machine for 20 minutes before testing.

6. Question: The screen keeps blinking after flashing when the machine is turned on. What should I do?

Answer: Take out the CF card and restart the machine to see if the display is back to normal. If the display is normal when the CF card is taken out, the CF card should be replaced. If the screen is still blinking, please contact your local dealer for assistance.

7. Question: Why does the system prompt display “checking CF card” when the machine is turned on?

Answer: The possible cause is that no CF card is in the machine or the CF card is inserted improperly or damaged. If it is damaged, it is necessary to replace a new one.

8. Question: What should I do if I cannot get into the diagnostic interface during test?

Answer: The possible cause is that no CF card is in the machine or CF card is inserted improperly or damaged. If it is damaged, it is necessary to replace a new one.

9. Question: Why the data cannot be inputted after the keyboard is activated?

Answer: The position where the cursor lies cannot be edited. Or you have not activated the cursor on the input position. Please use the touch pen to click the part to edit. When the cursor twinkles, you can input the data.

6.4 About system setting

1. Question: The screen is too white and characters cannot be seen. What is the reason and what should I do?

Answer: It may be caused by improper contrast. Please refer to the section “Contrast” to adjust the contrast.

2. Question: *The screen is inactive after the cross cursor appears on the screen. Why?*

Answer: The system is calibrating the touch screen. The machine will work after the screen is calibrated. Refer to the section “Touch Set” in User’s Manual.

3. Question: *Why does the screen flicks during engine starting?*

Answer: It is caused by the electromagnetic interference. There is nothing wrong with **Star** Auto Scanner.

4. Question: *Why is operation interrupted during diagnosis?*

Answer: It may be caused by electromagnetic interference or loose connection of connector.

5. Question: *Why is there no response from vehicle ECU during communication?*

Answer: Make sure that the voltage of vehicle battery, ignition timer and idle speed are in standard range; the throttle is in the closed position; and all electric devices, such as A/C, headlight, stereos etc, are turned off.

6. Question: *Some systems cannot be diagnosed. Why?*

Answer: The diagnostic socket for the system on some early vehicles may be separated. Refer to your vehicle service manual.

7. Question: *Why are there too many trouble codes?*

Answer: It may be caused by poor contact or poor grounding. Make sure that the vehicle model/year is selected correctly and the vehicle is equipped with the system.

6.5 About LCD Troubleshooting

1. Question: When I turn on the power, the yellow lamp (on the left) will light up and the sound “Di” is heard, what is the problem?

Answer: The converter is damaged. Replace a new converter.

2. Question: When I turn on the power, the yellow lamp (on the left) will light up, but there is no sound. The LCD screen lights up, but no “AUTOBOSS” is displayed, What should I do?

Answer: Testing: Switch ON/OFF for several times and check if the LCD display is working or not. If the LCD still does not work after the testing, the main board is damaged. Replace it with a new one.

3. Question: Reset the system... but there is no resetting process displayed on the screen, What is the problem?

Answer: The communication board is damaged. Replace a new one.

4. Question: The screen displays all information, but the menu is not working.

Answer: Turn off the power first. Press the screen slightly with the figure for a few seconds and turn on the power to calibrate the screen.

5. Question: How should I do If the LCD screen keeps blinking?

Answer: Please restart Star auto scanner and keep it far away from electromagnetic wave such as mobile phone.

7 Appendix

7.1 Mercedes Benz chassis and engine number chart

Chassis Family 251

Current Models	Year	Chassis	Engine
R350	2006--	251.165	272.967
R500	2006--	251.175	113.971

Chassis Family 230

Current Models	Year	Chassis	Engine
SL500	2003--	230.475	113.963
SL600 Bi Turbo	2004--	230.476	275.960
SL55 AMG Kompressor	2003--	230.474	113.992
SL65 AMG	2005--	230.479	275.981

Chassis Family 220

Current Models	Year	Chassis	Engine
S350	2006--	220.067	112.972
S430	2000--	220.170	113.941
S430 4MATIC	2003--	220.183	113.948
S500	2000--	220.175	113.960
S500 Guard	2001--	220.175	113.960
S500 4MATCI	2003--	220.184	113.966
S600 Bi Turbo	2003--	220.176	275.950('03) /275.960('04 -'06)

S55 (Kompressor)	AMG	2003--	220.174	113.991
S65 AMG		2006--	220.179	275.981

Chassis Family 219

Current Models	Year	Chassis	Engine
CLS500	2006--	219.375	113.967
CLS55 AMG	2006--	219.376	113.990

Chassis Family 215

Current Models	Year	Chassis	Engine
CL500	2000--	215.375	113.960
CL600 Bi Turbo	2003--	215.376	275.960('06) /275.950('03 /'05)
CL55 AMG(Kompressor)	2003--	215.374	113.991
CL65 AMG	2005--	215.379	275.980

Chassis Family 211

Current Models	Year	Chassis	Engine
E320-CDI	2005--	211.026	648.961
E350	2206--	211.056	272.964
E350 4MATIC	2006--	211.087	272.972
E350 Wagon	2006--	211.256	272.964
E350 4MATIC Wagon	2006--	211.287	272.972
E500	2003--	211.070	113.967

E500 4MATIC	2004--	211.083	113.969
E500 4MATIC Wagon	2004--	211.283	113.969
E55 AMG Wagon	2006--	211.276	113.990
E55 AMG (Kompressor)	2004--	211.076	113.990

Chassis Family 209

Current Models	Year	Chassis	Engine
CLK350	2006--	209.356	272.960
CLK350 Cabriolet	2006--	209.456	272.960
CLK500	2003--	209.375	113.968
CLK500 Cabriolet	2004--	209.475	113.968
CLK55 AMG	2003--	209.376	113.987
CLK55AMG Cabriolet	2004--	209.476	113.987

Chassis Family 203

Current Models	Year	Chassis	Engine
C230	2006--	203.052	272.920
C280	2006--	203.054	272.940
C280 4MATIC	2006--	203.092	272.941
C350	2006--	203.056	272.960
C350 4MATIC	2006--	203.087	272.970
C55 AMG	2005--	203.076	113.988

Chassis Family 171

Current Models	Year	Chassis	Engine
SLK280	2006--	171.454	272.942

SLK350	2005--	171.456	272.963
SLK55 AMG	2005--	171.473	113.989

Chassis Family 164

Current Models	Year	Chassis	Engine
ML350	2006--	164.186	272.967
ML500	2006--	164.175	113.964

Chassis Family 199

Current Models	Year	Chassis	Engine
SLR McLaren	2005--	199.376	155.980

Chassis Family 463

Current Models	Year	Chassis	Engine
G55 AMG	2002-2004	463.246	113.982
G500	2002-2005	463.249	113.962
G55K AMG	2003-2005	463.271	113.993

Chassis Family 220

Current Models	Year	Chassis	Engine
S600	2001-2002	220.178	137.970
S55 AMG	2001-2002	220.173	113.986

Chassis Family 215

Current Models	Year	Chassis	Engine
CL55 AMG	2001-2002	215.373	113.982
CL600	2001-2003	215.378	137.970

Chassis Family 211

Current Models	Year	Chassis	Engine
E320	2003-2005	211.065	112.949
E320 Wagon	2004-2005	211.265	112.949
E320 4MATIC	2004-2005	211.082	112.954
E320 Wagon 4MATIC	2004-2005	211.282	112.954

Chassis Family 210

Current Models	Year	Chassis	Engine
E320 Wagon 4MATIC	1998-2003	210.282	112.941
E320 Wagon	1998-2003	210.265	112.941
E55 AMG	1999-2002	210.074	113.980
E430 4MATIC	2000-2002	210.083	113.940
E430	1998-2002	210.070	113.940
E320 Sedan 4MATIC	1998-2002	210.082	112.941
E320 Sedan	1996-1997	210.055	104.995
E320 Sedan	1998-2002	210.065	112.941
E300 Turbo Diesel	1998-1999	210.025	606.962
E420	1997	210.072	119.985
E300 Diesel	1996-1997	210.020	606.912

Chassis Family 209

Current Models	Year	Chassis	Engine
CLK320	2003-2005	209.365	112.955
CLK320 Cabriolet	2004-2005	209.465	112.955

Chassis Family 208

Current Models	Year	Chassis	Engine
CLK430 Cabriolet	2002-2003	208.470	113.943
CLK320 Cabriolet	1999-2003	208.465	112.940
CKL55 AMG Cabriolet	2002	208.474	113.984
CLK55 AMG	2002	208.374	113.984
CLK430	1999-2002	208.370	113.943
CLK320	1998-2002	208.365	112.940

Chassis Family 203

Current Models	Year	Chassis	Engine
C320	2001-2005	203.064	112.946
C320 Wagon	2002-2005	203.246	112.946
C320 4MATIC	2003-2005	203.084	112.953
C230 Wagon 4MATIC	2003-2005	203.284	112.953
C32 AMG	2002-2004	203.065	112.961
C230 CL 1.8 Kompressor	2003-2005	203.740	271.948
C240 2.6	2001-2005	203.061	112.912
C240 2.6 (w/717.4MT)	2001-2005	203.061	112.912
C240 4MATIC	2003-2005	203.081	112.916

C240S	2003-2005	203.261	112.912
C240S (Wagon) 4MATIC	2003-2005	203.281	112.916
C230 1.8 Kompressor	2004-2005	203.040	271.948
C320 CL	2004-2005	203.764	112.946
C230 CL	2002	203.747	111.981

Chassis Family 202

Current Models	Year	Chassis	Engine
C43 AMG	1998-2000	202.033	113.944
C280	1998-2000	202.029	112.920
C230 Kompressor	1999-2000	202.024	111.975(2000)&111.974('99)
C36 AMG	1995-1997	202.028	104.941
C230	1997-1998	202.023	111.974
C280	1994-1997	202.028	104.941
C220	1994-1996	202.022	111.961

Chassis Family 201

Current Models	Year	Chassis	Engine
190D 2.5 Turbo	1987	201.128	602.961
190 E 2.6	1987-1992	201.029	103.942
190 E 2.3-16	1986-1987	201.034	102.983
190 D 2.5	1986-1989	201.126	602.911
190 D2.2	1984-1985	201.122	601.921
190 E2.3	1984-1998	201.028/024	102.961/102.985

NOTE: The chassis # is the same as the Manufacturer's ID #, or, i.e., the registration #. The engine # may be obtained from the original documentation supplied with your vehicle

7.2 BMW body code chart

Model	Body	Years	Motor	DME
316i	E30	1988-91	M40	M1.3
318i	E30	9/87-89	M40	M1.3
318is	E30	1990-91	M42/B18	M1.7
318i/is	E36	1992-12/93	M42/B18 DISA	M1.7
318i/is	E36	1/94-12/94	M42/B18DISA2	M1.7.2
318i/is/Ti	E36	1/95-8/95	M42/B18DISA2	M1.7.2 w/ WS-II
318i/is/Ti	E36	1996-98	M44/B19	M5.2 (OBD-II)
318i/is	E46	1999-2001	M43	MS43
323Ci	E46	6/98-9/00	M52tu B25	MS42.0(OBD-II)
325	E30	1988	M20/B27	M1.1
325e/es	E30	9/84-9/87	M20/B27	Basic M1.0
325i/is/iX	E30	87-8/90	M20/B25	M1.3
325i/is	E36	9/90-8/91	M50/B25	M3.1
325i/is	E36	9/91-8/92	M50/B25	M3.1
325i/is/ic	E36	9/92-12/94	M50tu/B25	M3.3.1
325i/is/ic	E36	1/95-8/95	M50tu/B25	M3.3.1w/EWS-II
325i/Ci	E46	9/00-	M54 B325	MS43
328i	E36	1996-98	M52/B28	MS41.1
328i	E46	6/98-6/00	M52/B28	MS42.0
330i/Ci/Xi	E46	6/00-	M54 B30	MS43
330i/Ci/Xi	E46	6/02	M56 B30	MS43
M3	E30	1988-91	S14/B23	M1.0Motorsport
M3- Evo2	E30	1989-91	S14/B23	M1.0Motorsport

M3- Evo3	E30	1988-91	S14/B25	M1.0Motorsport
M3- Euro	E36	1993-95	S50/B30	M3.3
M3	E36	thru12/95	S50us/B30	M3.3.1
M3	E36	1/95+	S50us/B30	M3.3.1w/EWS-II
M3	E36	1996-99	S50us/B32	MS41.1
M3	E36	1996-99	S52	MS41.2
M3	E46	1999-2000	S54	MS S52
M3	E46	01/01-	S54B32	MS S54
Z3	E36	1996	M44/B19	M5.2
Z3	E36	1997+	M52/B28	MS41.1
525i	E34	1989-90	M20/B25	M1.3
525i	E34	thru	8/91	M50/B25
525i/iT	E34	9/91-1/92	M50/B25	M3.1
525i/iT	E34	2/92-93	M50/B25	M3.1
525i/iT	E34	93-12/94	M50tu/B25	M3.3.1
525i/iT	E34	1/95-1996	M50tu/B25	M3.3.1w/EWS-II
525i/it/A	E39	2001-2002	M54/B25	MS43
528e	E28	1988	M20/B27	M1.1
528i/it/A	E39	1997-2000	M52/B28	MS41.1
530i	E34	3/93-8/94	M60/B30	M3.3
530i	E34	9/94-12/94	M60/B30	M3.3 w/ air ump
530i	E34	1/95-4/94	M60/B30	M3.3 w/ EWS-II
530i/it/A	E39	2001-	M54/B30	MS43
535i/is	E28	1988	M30/B34	M1.0 Adaptive (28 pin)
535i	E34	1989-92	M30/B35	M1.3
540i	E34	thru12/94	M60/B40	M3.3
540i	E34	1/95+	M60/B40	M3.3 w/ EWS-II
540i	E39	1996-8/98	M62/B44	M5.2

540i/iA/iTA	E39	9/98-2001	M62tu	ME7.2
M5	E34	1991+	S38/B36	M1.2
M5	E39	9/99-2001	S62B50	MS S52
635csi	E24	1988	M30/B35	M1.1
635csi	E24	1989	M30/B35	M1.3
735i/iL	E32	1/88	M30/B35	M1.1
735i/iL	E32	1989-92	M30/B35	M1.3
740i/iL	E32	9/92-4/94	M60/B40	M3.3
740i/iL	E38	1/95+	M60/B40	M3.3 w/ EWS-II
740i/IL	E38	1996-99	M62/B44	M5.2 (OBD-II)
740iA/ILA	E38	9/98-2001	M62tu	ME 7.2
745i	E65	11/2001	N62	ME 9.2
745Li	E66	01/2002	N62	ME 9.2
750iL	E32	1988-90	M70/B50	M1.2
750iL	E32	1991+	M70/B50	M1.7
750iL	E38	9/94-8/96	M73/B54	M5.2 (OBD-II)
750iL	E38	9/96+	M73/B54	M5.2.1 (OBD-II)
760i	E65	11/2001	N73	ME 9.2
840i	E31	9/93-12/94	M60/B40	M3.3
840i	E31	1/95+	M60/B40	M3.3 w/ EWS-II
840i	E31	1996+	M62/B44	M5.2 (OBD-II)
850i	E31	1991+	M70/B50	M1.7
X5	E53	1998-2000	M52	MS42
X5	E53	2000-2001	M54	MS43
X5	E53	1999-2001	M62TU	ME7.2
Z8	E52	9/99-2001	S62	MS S52
Z4	E85	2003-	M54B25/B30	MS45

7.3 Block and parameter for Volkswagen vehicle

The Block Number of Audi A8 (MPI 2.8L 2 Valves)

Group Number	Basic Setting		Designation
	Address	Display	
00	A	135~160	A: engine coolant temperature, readout: 50=... °C If the value is out of the range, check sensor or circuit or ECU
	B	150~165	B: output voltage of air mass flow readout: 100=1V
	C	28~32	C: engine speed readout: 25=...rpm
	D	0~10 or 240~255	D: learning value of idling speed stabilization, manual gearbox in neutral or automatic gearbox with selector lever in P or N
	E	0~10 or 240~255	E: learning value of idling speed stabilization, manual gearbox with drive mode engaged (average value 0). [0 is always displayed for vehicles with manual gearbox.]

	F	126~130	F: feedback of idling speed stabilization (average value 128)
	G	20	G: shift input
	H	120~136	H: Lambda control value (average value 128/ cylinder 1 to 3)[0 is always displayed for engines without Lambda probe.]
	I	0 or 3	I: Lambda learning demand in idling and part load range [0=Lambda learning demand in idling and part load range] [3=Lambda learning process in idle complete]
	J	50~100	J: learning value of throttle valve potentiometer G69 readout: 5=...mV
01	A	80~105°C	A: Engine coolant temperature If the value is out of the range, check sensor or circuit or ECU

	B	1.47~1.62V	<p>B: air mass flow output voltage</p> <p>1. If the voltage is lower than 1.47V, check the leakage between MAF and intake air manifold</p> <p>2. If the voltage is higher than 1.62V, please check the following items:</p> <p>(1) whether the electric applications closed or not</p> <p>(2) whether the power steering in the middle position (the vehicle wheel in straight line)</p> <p>(3) whether the shift lever in P/N</p>
	C	---	<p>C: air mass flow sensor ground wire.</p> <p>If the value is 0.02V, it means the ground wire defective.</p>
	D	12~14V	<p>D: MPI control unit voltage supply</p>

02	A	0.25~4.75V	A: throttle valve potentiometer voltage (coarse) 1) The sensor voltage should be .025V when the throttle closed; 2) The sensor voltage should be 4.75V when the throttle wide open; 3) If the value is out of the range, please check the throttle valve or throttle position sensor;
	B	0.50~1.27V	B: throttle valve potentiometer voltage (fine) 1) The sensor voltage should be 0.5V when the throttle closed; 2) The sensor voltage should be 1.27V when the throttle is at lower load; 3) If the value is out of the range, please check the throttle valve or throttle position sensor;

	C	0.25~0.50V	C: learning value of throttle valve potentiometer please check the following items: 1) Whether the electric applications closed or not; 2) Whether the power steering in the middle position (the vehicle wheel in straight line) 3) Whether the shift lever in P/N.
	D	0=open 1=closed	D: mechanical idling speed switch If the value is out of the range, please check the throttle position sensor or electric circuit
03	A	700~800rpm	A: Idle speed 1) If the idle speed is lower than 700rpm, please check TP switch or IAC valve 2) If the idle speed is higher than 800rpm, please check TP switch or IAC valve or the leakage of intake air system, meanwhile, be sure the shift lever in P/N

	B	15.0~32.0%	<p>B: Engine load</p> <ol style="list-style-type: none"> 1) Whether the electric applications closed or not 2) Whether the power steering in the middle position (the vehicle wheel in straight line) 3) Whether the shift lever in P/N 4) Check TP sensor or EGR valve or IAC valve damaged
	C	Full load 95%	<p>C: throttle valve angle</p> <ol style="list-style-type: none"> 1) The value should be 0% at idle speed; 2) The value should be higher than 95% when the throttle is open; 3) Check TP sensor or electric circuit.
	D	...Km/h (According to vehicle speed)	<p>D: Road speed</p> <p>If the odometer can not display the vehicle speed, check the electric circuit between odometer and ECM</p>
04	A	0±2	<p>A: Idling speed regulator</p>
	B	M/T: +4~16 A/T: 0~+20	<p>B: learning value of idling speed stabilization</p>

	C	A/T: +10~-20	C: learning value of idling speed stabilization
	D	0011	D: Shift inputs 1= always “1”, except “0” if gear engaged in automatic gearbox 2= mechanical idling speed switch (0=open; 1=closed) 3= AC compressor (0= off; 1= on) 4= always “0”
05	A	-25%~+25%	A: Lambda learning value at idling speed (Bank 1)
	B	-25%~+25%	B: Lambda learning value at part load (Bank 1)
	C	-25%~+25%	C: Lambda learning value at part load (Bank 1)
	D	-25%~+25%	D: Lambda learning value at part load (Bank 1)
06	A	-25%~+25%	A: Lambda learning value at idling speed (Bank 2)
	B	-25%~+25%	B: Lambda learning value at part load (Bank 2)
	C	-25%~+25%	C: Lambda learning value at part load (Bank 2)
	D	-25%~+25%	D: Lambda learning value at part load (Bank 2)

07	A	0.0±6.0%	A: Lambda control (Bank 1) If the value is out of the range, please check the leakage of intake air system, the injector or O2 sensor learning value
	B	...%	B: O2 sensor learning value
	C	XXXX	C: Lambda learning demand diagnosis (If diagnosis has been performed, the appropriate value is set to "1"). X1, X2= idling speed (Bank 1, 2) X3, X4= part load 1 (Bank 1, 2) X5, X6= part load 2 (Bank 1, 2) X7, X8= part load 3 (Bank 1, 2)

	D	XXXXXXX	<p>D: Lambda learning demand display</p> <p>0= request for renew learning</p> <p>1= learning process ended</p> <p>X1, X2= idling speed (Bank 1, 2)</p> <p>X3, X4= part load 1 (Bank 1, 2)</p> <p>X5, X6= part load 2 (Bank 1, 2)</p> <p>X7, X8= part load 3 (Bank 1, 2)</p>
08	A	0.0±6.0%	<p>A: Lambda control (Bank 2)</p> <p>If the value is out of the range, please check the leakage of intake air system, the injector or O2 sensor learning value</p>
	B	...%	B: O2 sensor learning value

	C	XXXXXXXX	<p>C: Lambda learning demand diagnosis (if diagnosis has been performed, the appropriate value is set to "1".)</p> <p>X1, X2= idling speed (Bank 1, 2)</p> <p>X3, X4= part load 1 (Bank 1, 2)</p> <p>X5, X6= part load 2 (Bank 1, 2)</p> <p>X7, X8= part load 3 (Bank 1, 2)</p>
	D	XXXXXXXX	<p>D: Lambda learning demand display</p> <p>0= request for renew learning</p> <p>1= learning process ended</p> <p>X1, X2= idling speed (Bank 1, 2)</p> <p>X3, X4= part load 1 (Bank 1, 2)</p> <p>X5, X6= part load 2 (Bank 1, 2)</p> <p>X7, X8= part load 3 (Bank 1, 2)</p>

09	A	$0.0 \pm 6.0\%$	A: Lambda control (Bank 1) If the value is out of the range, please check the leakage of intake air system, the injector or O2 sensor learning value
	B	$0.0 \pm 6.0\%$	B: Lambda control (Bank 2) If the value is out of the range, please check the leakage of intake air system, the injector or O2 sensor learning value
	C	0.0~99.0%	C: EVAP canister purge valve
	D	Idling: 0% Full load: 95%	D: throttle valve angle
10	A	Less than 8%	A: total from Lambda control (Bank 1) and momentary Lambda learning value (Bank 1)
	B	Less than 8%	B: total from Lambda control (Bank 2) and momentary Lambda learning value (Bank 2)
	C	Greater than 0.6V or less than 0.3V	C: voltage signal Bank 1 Lambda probe 1 --- O2 sensor should be lower than 0.3V or higher than 0.6V, otherwise check O2 sensor or heater

	D	Greater than 0.6V or less than 0.3V	D: voltage signal Bank 2 Lambda probe 1 --- O2 sensor should be lower than 0.3V or higher than 0.6V, otherwise check O2 sensor or heater
11	A	...° BTDC	A: ignition timing point without knock control and without digital idling speed stabilization when TP closed, the ignition angle is 12°BTDC.
	B	...° BTDC	B: Ignition-timing point with knock control and with digital idling speed stabilization when engine load is over 40%, knock control begins to work.
	C	...±°CA	C: ignition timing point manipulation for digital idling speed stabilization
	D	0= open; 1= closed	D: idling speed switch function
12	A	...rpm	A: engine speed
	B	...%	B: engine load
	C	1 st map or 2 nd map	C: ignition timing map changeover
	D	...±°CA	D: ignition timing retardation of knock control

13	A	1 st map or 2 nd map	A: ignition timing map changeover B: ignition timing retardation of knock control (cylinder 1) C: ignition timing retardation of knock control (cylinder 2) D: ignition timing retardation of knock control (cylinder 3)
	B	...± °CA	
	C	...± °CA	
	D	...± °CA	
14	A	1 st map or 2 nd map	A: ignition timing map changeover B: ignition timing retardation of knock control (cylinder 4) C: ignition timing retardation of knock control (cylinder 5) D: ignition timing retardation of knock control (cylinder 6)
	B	...± °CA	
	C	...± °CA	
	D	...± °CA	
15	A	...rpm	A: engine speed
	B	...V	B: knock sensor signal (cylinder 1)
	C	...V	C: knock sensor signal (cylinder 2)
	D	...V	D: knock sensor signal (cylinder 3)
16	A	...map	A: engine speed
	B	...V	B: knock sensor signal (cylinder 4)
	C	...V	C: knock sensor signal (cylinder 5)
	D	...V	D: knock sensor signal (cylinder 6)

17	A	700~800rpm	A: idle speed
	B	...%	B: engine load
	C	...%	C: EGR duty cycle
	D	0...255°C	D: exhaust gas re-circulation temperature
18	A	...%	A: internal specified cycle of idling speed stabilization valve-N71
	B	AMPS	B: current consumption of idling speed stabilization valve-N71
	C	-40~+60%	C: current control of idling speed stabilization valve-N71
	D	12~14V	D: voltage supply of MPI control unit
19	A	...%	A: engine load
	B	...g/s	B: air volume induced
	C	Km/h	C: road speed
	D	...m/s	D: injection time
22	A	0~12	A: reducing stage
	B	...±°CA	B: ignition timing retardation as a consequence of ASR
	C	-68Nm~250Nm	C: reduced engine torque
	D	-68Nm~250Nm	D: non-reduced engine torque
99	A	...rpm	A: engine speed
	B	...%	B: engine load
	C	°C	C: coolant temperature
	D	λ con. OFF or λ con. ON	D: Lambda control OFF/ON

The block number of PASSAT B5

Group NO:	Basic Setting		Designation
	Add.	Display	
00	A	170~204	A: momentary coolant temperature (equals to 80~105°C)
	B	17~44	B: engine load (equals to 0.85~2.2ms)
	C	82~90	C: idle speed (equals to 820~900rpm) 1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system 3) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system
	D	142~206	D: MPI control unit voltage supply (equals to 10~14.5V)
	E	0~12	E: throttle valve angle (equals to 0~5°)
	F	123~133	F: idle speed regulator (equals to -2.5~+2.5g/h)
	G	120~136	G: feedback of idling speed (equals to -4.0~+4.0kg/h) stabilization (average value 128)
	H	77~179	H: Lambda control value (equals to -10%~+10%)
	I	115~141	I: Lambda learning value (equals to -0.64~+0.64ms) (average value 128)
	J	117~138	J: Lambda learning value (equals to -8.0~+8.0%)

01	A	820~900 rpm	<p>A: idle speed</p> <ol style="list-style-type: none"> 1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system 2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system
	B	1.0~2.5 ms	<p>B: engine load if the value is higher than 2.50ms, please check the following items:</p> <ol style="list-style-type: none"> 1) The blockage of injector or spark plug 2) The throttle control unit 3) The power steering should be in the middle position 4) Shift lever should be in P/N
	C	0~5°	<p>C: throttle valve angle</p> <p>If the throttle valve angle is higher than 5°, please check the following items:</p> <ol style="list-style-type: none"> 1) The adaptation between engine ECU and the throttle control unit 2) The throttle control unit 3) Adjust accelerator cable 4) Fuel supply system 5) Throttle operating system

	D	5.25°~14 .25°v. OT	D: ignition angle If the value is out of the range, please check the following items: ---Electric applications ---Adjust power steering to middle position ---Air leakage
02	A	820~900 rpm	A: idle speed 1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system 2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system
	B	1.0~2.5 ms	B: engine load 1) If the value is lower than 1.00ms, please check purge valve, because the fuel evaporation in purge canister too high or you can check the injection rate 2) If the value is higher than 2.50ms, please check the electric load, for example, A/C compressor or power steering, etc

	C	2~5ms	<p>C: Injection time</p> <ol style="list-style-type: none"> 1) Check the activated carbon canister solenoid 2) Check the fuel system and activated carbon canister 3) Check the injection rate
	D	2~4g/s	<p>D: Air volume induced</p> <ol style="list-style-type: none"> 1) If the value is lower than 2.0g/s, it means there is a lot of air mass which is not calculated by the mass air flow meter. 2) If the value is higher than 4.0g/s, please check the following items: ----Shift selector not in P/N ----Turn off electric applications (Air conditioner, power steering etc)
03	A	820~900 rpm	<p>A: Idle speed</p> <ol style="list-style-type: none"> 1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system 2) if the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system

	B	10.0~14.5V	<p>B: MPI control unit voltage supply</p> <p>1) If the voltage is lower than 2.000V, please check the following items:</p> <ul style="list-style-type: none"> ① check the voltage and charge the battery ② increase engine speed for several minutes and turn off the electric applications ③ check the power supply of engine control unit ④ check the creep of electricity <p>2) If the voltage is higher than 14.500V, Check the voltage and change the regulator if necessary</p>
	C	80~105 °C	<p>C: engine coolant temperature</p> <p>1) if the coolant temperature is lower than 80°C,please check the following items:</p> <ul style="list-style-type: none"> ① make a road test if necessary ② check coolant temperature sensor <p>2) if the coolant temperature is higher than 105 °C ,please check the following items:</p> <ul style="list-style-type: none"> ① clean the radiator ② check the cooling fan ③ check the thermostat ④ check the coolant temperature sensor

	D	---°C	D: intake air temperature According to the environment temperature. if the value is always at 19.5 °C , please check intake air temperature sensor G42 or circuit
04	A	0~5°	A: throttle valve angle If the throttle valve angle is higher than 5°, please check the following items: 1) The adaptation between engine ECU and the throttle control unit 2) The throttle control unit 3) Adjust accelerator cable 4) Fuel supply system 5) Throttle operating system
	B	-1.7~+1.7g/s	B: learning value of mass air flow idling speed stabilization
	C	-1.7~+1.7g/s	C: learning value of mass air flow idling speed stabilization
	D	Idling	D: idle speed, full load, part load, power enrichment, overdrive cutoff
05	A	820~900 rpm	A: idle speed 1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system 2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system

	B	860rpm	B: idle speed (M/T)
	C	-10~+10 %	C: Lambda learning value at part Load (idle speed regulator)
	D	2.0~4.0g /s	D: air volume induced
06	A	0~2550r pm	A: engine speed
	B	-10.0~+1 0.0%	B: Lambda learning value at part load (idle speed regulator)
	C	-10~+10 %	C: Lambda learning value at part load (idle speed regulator) check the following items: 1) The leakage of intake air system 2) The rate of injection 3) λ learning value
	D	-10°~+4 5°v. OT	D: ignition angle If the value is out of the range, please check the following items: ---Electric applications ---Adjust power steering to middle position ---Air leakage
07	A	-10~+10 %	A: Lambda learning value at part load (idle speed regulator)

	B	0.0~1.0V	<p>B: O2 sensor voltage</p> <ol style="list-style-type: none"> 1) If the mixture air is rich, the voltage of O2 sensor is 0.7~1.0V. 2) If the mixture air is lean, the voltage of O2 sensor is 0.0~0.3V. 3) The displayed value should be lower than 0.3V and higher than 0.6V now and then, when the value is lower than 0.45V, it means air mixture too lean; when the value is higher than 0.45V, it means air mixture too rich.
	C	0~99%	C: EVAP canister purge valve
	D	0.30~1.1 0	D: Lambda for fuel tank vent valve
09	A	820~900 rpm	<p>A: idle speed</p> <ol style="list-style-type: none"> 1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system 2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system
	B	-10~+10 %	B: Lambda control value

	C	0.0~1.0V	<p>C: O2 sensor voltage</p> <p>1) If the mixture air is rich, the voltage of O2 sensor is 0.7~1.0V.</p> <ul style="list-style-type: none"> ---Check fuel pressure regulator and holding pressure ---Check the injector ---Contaminated, repair or replacement ---Check coolant temperature sensor ---Check purge solenoid valve 1 <p>2) If the mixture air is lean, the voltage of O2 sensor is 0.0~0.3V.</p> <ul style="list-style-type: none"> ---Check spark plug <p>3) The displayed value should be lower than 0.3V and higher than 0.6V now and then, when the value is lower than 0.45V, it means air mixture too lean; when the value is higher than 0.45V, it means air mixture too rich.</p> <ul style="list-style-type: none"> ---Check the leakage of intake air system
	D	-10~10%	D: Lambda value at idle speed (add.)
10	A	0~99%	A: EVAP canister purge valve
	B	0.3~1.20	B: Lambda correction for fuel tank vent
	C	-3~+32	<p>C: fuel tank vent evaporative</p> <p>-3: no fuel evaporation in charcoal purge +32:fuel evaporation saturated in charcoal purge</p>

	D	0.0~0.30	D: EVAP tank vacuum decay slope 0.00: no fuel in purge canister 0.30: 30% of fuel evaporation coming from AKF
11	A	820~900 rpm	A: idle speed 1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system 2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system
	B	1.0~2.5 ms	B: engine load 1) Lower value only occurs at the conditions of overdrive cutoff 2) If the value is higher than 2.5ms, please check the following items: ---Mass air flow meter damaged ---Throttle control unit damaged ---Electric applications ---Adjust power steering to middle position
	C	0 km/h	C: road speed
	D	0.5~1.5 l/h	D: fuel consumption

14	A	820~900 rpm	<p>A: idle speed</p> <p>1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system</p> <p>2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system</p>
	B	1.0~2.5 ms	<p>B: engine load</p> <p>1) Lower value only occurs at the conditions of overdrive cutoff</p> <p>2) If the value is higher than 2.5ms, please check the following items:</p> <ul style="list-style-type: none"> ---Mass air flow meter damaged ---Throttle control unit damaged ---Electric applications ---Adjust power steering to middle position
	C	0~15°kW	<p>C: Ignition timing retardation of knock control (cylinder 1)</p> <p>1) If the voltage difference is higher than 50% between max. And min., the possible reason is that the connector corroded</p> <p>2) The knock control begins to work when engine load is higher than 40%</p>

	D	0~15°kW	<p>D: ignition timing retardation of knock control (cylinder 2)</p> <p>If the voltage difference is higher than 50% between max. And min., the possible reason is that the connector corroded</p> <p>The knock control begins to work when engine load is higher than 40%</p>
15	A	820~900 rpm	<p>A: idle speed</p> <p>1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system</p> <p>2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system</p>
	B	1.0~2.5 ms	<p>B: engine load</p> <p>1) Lower value only occurs at the conditions of overdrive cutoff</p> <p>2) If the value is higher than 2.5ms, please check the following items:</p> <ul style="list-style-type: none"> ----Mass air flow meter damaged ----Throttle control unit damaged ----Electric applications ----Adjust power steering to middle position

	C	0~15°kW	C: ignition timing retardation of knock control (cylinder 3) 1) If the voltage difference is higher than 50% between max. and min., the possible reason is that the connector corroded 2) The knock control begins to work when engine load is higher than 40%
	D	0~15°kW	D: ignition timing retardation of knock control (cylinder 4) 1) If the voltage difference is higher than 50% between max. and min., the possible reason is that the connector corroded 2) The knock control begins to work when engine load is higher than 40%
16	A	0.3~1.4V	A: Knock sensor signal (cylinder 1) 1) If the voltage difference is higher than 50% between max. and min., the possible reason is that the connector corroded 2) The signal voltage of knock control can reach 5.1V at high speed
	B	0.3~1.4V	B: knock sensor signal (cylinder 2) 1) If the voltage difference is higher than 50% between max. and min., the possible reason is that the connector corroded 2) The signal voltage of knock control can reach 5.1V at high speed

	C	0.3~1.4V	C: knock sensor signal (cylinder 3) 1) If the voltage difference is higher than 50% between max. and min., the possible reason is that the connector corroded 2) The signal voltage of knock control can reach 5.1V at high speed
	D	0.3~1.4V	D: knock sensor signal (cylinder 4) 1) If the voltage difference is higher than 50% between max. and min., the possible reason is that the connector corroded 2) The signal voltage of knock control can reach 5.1V at high speed
18	A	820~900 rpm	A: idle speed 1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system 2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system

	B	1.0~2.5 ms	<p>B: engine load</p> <ol style="list-style-type: none"> 1) Lower value only occurs at the conditions of overdrive cutoff 2) If the value is higher than 2.5ms, please check the following items: ---Mass air flow meter damaged ---Throttle control unit damaged ---Electric applications ---Adjust power steering to middle position
	C	---	C: engine load, throttle open angle
	D	-30~+25 %	<p>D: altitude correction value</p> <p>-30%: equals 700mbar 25%: equals 1250mbar</p>
19	A	820~900 rpm	<p>A: idle speed</p> <ol style="list-style-type: none"> 1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system 2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system

	B	1.0~2.5 ms	<p>B: engine load</p> <p>1) Lower value only occurs at the conditions of overdrive cutoff</p> <p>2) If the value is higher than 2.5ms, please check the following items:</p> <ul style="list-style-type: none"> ---Mass air flow meter damaged ---Throttle control unit damaged ---Electric applications ---Adjust power steering to middle position
	C	X1X or X0X	<p>C: cylinder block status</p>
	D	12.0°v. OT	<p>D: ignition angle</p> <p>If the value is out of the range, please check the following items:</p> <ul style="list-style-type: none"> ---Electric applications ---Adjust power steering to middle position ---Air leakage
20	A	820~900 rpm	<p>A: idle speed</p> <p>1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system</p> <p>2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system</p>

	B	Neutral Gear selected ON	B: shift status
	C	A/C High or A/C Low	C: A/C status
	D	Compre sor ON or compre sor OFF	D: A/C compressor switch check A/C compressor signal
21	A	820~900 rpm	A: idle speed 1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system 2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system

	B	1~2.5ms	B: engine load 1) Lower value only occurs at the conditions of overdrive cutoff 2) If the value is higher than 2.5ms, please check the following items: ---Mass air flow meter damaged ---Throttle control unit damaged ---Electric applications ---Adjust power steering to middle position
	C	-39~+14 0°C	C: coolant temperature
	D	λ -Reg. OFF or λ -Reg. ON	D: Lambda control
23	A	100000	A: learning value demand display
	B	72.0~95. 0%	B: TPS position at minimum display the last learning value
	C	67.0~83. 0%	C: TPS position at emergency display the last learning value
	D	18.0~54. 0%	D: TPS position at maximum display the last learning value
24	A	0~6800r pm	A: engine speed
	B	0~10.00 ms	B: engine load

	C	20°n. OT~ 40°n. OT	C: ignition angle If the value is out of the range, please check the following items: ---Electric applications ---Adjust power steering to middle position ---Air leakage
	D	0~72°kW	D: ignition timing retardation angle (cylinder 1~4)
25	A	---	A: engine working status
	B	-30~+30 °kW	B: Hall sensor adjustment
	C	X00	C: MAP/CAM changeover
	D	-3~+21°k W	D: camshaft adjustment
26	A	0~6800r pm	A: engine speed
	B	0~10.ms	B: engine load
	C	X00	C: MAP/CAM changeover
	D	-3~+21°k W	D: camshaft adjustment
95	A	820~900 rpm	A: idle speed 1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system 2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system

	B	1.0~2.5 ms	<p>B: engine load</p> <p>1) Lower value only occurs at the conditions of overdrive cutoff</p> <p>2) If the value is higher than 2.5ms, please check the following items:</p> <ul style="list-style-type: none"> ---Mass air flow meter damaged ---Throttle control unit damaged ---Electric applications ---Adjust power steering to middle position
	C	12°v. OT	<p>C: ignition angle</p> <p>If the value is out of the range, please check the following items:</p> <ul style="list-style-type: none"> ---Electric applications ---Adjust power steering to middle position ---Air leakage
	D	80~105 °C	<p>D: coolant temperature</p> <p>1) If the temperature is lower than 80°C, you must make a road test and check the coolant temperature sensor</p> <p>2) If the temperature is higher than 110 °C , please clean the radiator, electric fan, coolant regulator as well as coolant temperature sensor</p>
98	A	---	<p>A: throttle valve potentiometer voltage G69</p>
	B	0.5~4.9V	<p>B: throttle position sensor voltage G127</p>

	C	Idling part throttle	C: engine running status
	D	RUNNING OK ERROR	D: adaptation mode
99	A	820~900 rpm	<p>A: idle speed</p> <p>1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system</p> <p>2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system</p>
	B	-40~125 °C	B: coolant temperature
	C	-10%~+1 0%	C: Lambda value at idle speed
	D	λ -Reg. OFF λ -Reg. ON	D: Lambda control OFF/ON

7.4 The block number of AUDI 100/200 2.6E

Group No.	Basic Setting		Designation
	Address	Display	
00	---	---	No designation

01	A	680~820rpm	<p>A: idle speed</p> <p>1. If idle speed is higher than 820rpm:</p> <ul style="list-style-type: none"> ①idle switch F60 defective ②air leakage, check intake air system ③idle speed control valve N71 fault <p>2. If idle speed is lower than 680rpm:</p> <ul style="list-style-type: none"> ①idle speed control valve N71 fault ②idle switch F60 defective
	B	MAP	<p>B: intake air manifold absolute pressure</p> <p>100% = 1022 Pa or Hg?</p> <p>32% = 327 Pa or Hg?</p> <p>29~59%: at idle speed</p>
	C	6~12 BTDC °	<p>C: ignition angle</p> <p>If the value is out of the range, please check the following items:</p> <ul style="list-style-type: none"> ---Electric applications ---Adjust power steering to middle position ---Air leakage

	D	18~75 steps	D: steps for idle speed control valve N71 If the step value is out of the range, N71 valve will be blocked or inactive.
02	A	0~85%	A: Throttle angle 0%: throttle valve closed (idle speed) 85%: throttle wide open if the value is higher than 0% at idle speed, the throttle potentiometer G69 maybe damaged. If the value is lower than 85% at the throttle valve wide open, the throttle potentiometer G69 is defective.
	B	MAP	B: manifold absolute pressure 100% = 1022 Pa or Hg? 32% = 327 Pa or Hg? 29~59%: at idle speed
	C	81~111°C	C: Coolant temperature If the coolant temperature is higher than 111°C, the coolant temperature sensor or circuit failure.
	D	---°C	D: Intake air temperature relative to environment temperature

			A: Lambda control value (cylinder 1~3) 1) If the value is lower than 0.75: ① fuel system pressure too high ② fuel injector leakage ③ O2 sensor /heater failure <i>Please check the following items:</i> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater 2) If the value is higher than 1.25: ① fuel system pressure too low ② fuel injector blocked ③ O2 sensor /heater failure ④ catalytic system leakage <i>Please check the following items:</i> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater
03	A	0.75~1.25	

			B: Lambda control value (cylinder 4~6) 1) If the value is lower than 0.75: ① fuel system pressure too high ② fuel injector leakage ③ O2 sensor /heater failure <i>Please check the following items:</i> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater 2) If the value is higher than 1.25: ① fuel system pressure too low ② fuel injector blocked ③ O2 sensor /heater failure ④ catalytic system leakage <i>Please check the following items:</i> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater
B	0.75~1.25		

	C	0.75~1.25	C: Lambda control value (cylinder 1~3) If the value is out of the range, it means the mixture air is too rich, the quantity of fuel injection must be reduced; or the mixture air is too lean, the quantity of fuel injection must be raised
	D	0.75~1.25	D: Lambda control value (cylinder 1~3) If the value is out of the range, it means the mixture air is too rich, the quantity of fuel injection must be reduced; or the mixture air is too lean, the quantity of fuel injection must be raised
04	A	Lambda control adaptation	A: refer to the Lambda control table enclosed
	B	---	B: Lambda control adaptation for purge canister
	C	0.75~1.25	C: Lambda control value (cylinder 1~3) if the value is out of the range, it means the mixture air is too rich, the quantity of fuel injection must be reduced; or the mixture air is too lean, the quantity of fuel injection must be raised

	D	0.75~1.25	<p>D: Lambda control value (cylinder 1~3)</p> <p>If the value is out of the range, it means the mixture air is too rich, the quantity of fuel injection must be reduced; or the mixture air is too lean, the quantity of fuel injection must be raised</p>
05	A	680~820rpm	<p>A: Idle speed</p> <p>1) If idle speed is higher than 820rpm:</p> <ul style="list-style-type: none"> ①idle switch F60 defective ②air leakage, check intake air system ③idle speed control valve N71 fault <p>2). If idle speed is lower than 680rpm:</p> <ul style="list-style-type: none"> ①idle speed control valve N71 fault ②idle switch F60 defective
	B	60°	<p>B: Knock control</p> <p>If the value is too low, it means the components loose or intake air temperature too high</p>

	C	6~12 BTDC °	C: ignition angle If the value is out of the range, please check the following items: ---Electric applications ---Adjust power steering to middle position ---Air leakage
	D	81~111 °C	D: coolant temperature If the coolant temperature is higher than 111 °C , the coolant temperature sensor or circuit failure.
06	A	10~60	A: Steps for idle speed control valve N71 If the step value is out of the range, it means intake air system failure or idle speed control valve damaged.
	B	18~75 steps	B: Idle speed control value (current) If the value is always 35, please check idle speed control valve.
	C	--	C: Idle speed control is affected by other signal
	D	--	D: Idle speed control

07	A	10~60	A: steps for idle speed control valve N71 If the step value is out of the range, it means intake air system failure or idle speed control valve damaged.
	B	81~111°C	B: coolant temperature If the coolant temperature is higher than 111 °C , the coolant temperature sensor or circuit is defective.

			C: Lambda control value (cylinder 1~3) 1) If the value is lower than 0.75: ① fuel system pressure too high ② fuel injector leakage ③ O2 sensor /heater failure <i>Please check the following items:</i> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater 2) If the value is higher than 1.25: ① fuel system pressure too low ② fuel injector blocked ③ O2 sensor /heater failure ④ catalytic system leakage <i>Please check the following items:</i> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater
C	0.75~1.25		

	D	0.75~1.25	<p>D: Lambda control value (cylinder 4~6)</p> <p>1) If the value is lower than 0.75:</p> <ul style="list-style-type: none"> ① fuel system pressure too high ② fuel injector leakage ③ O2 sensor /heater failure <p><i>Please check the following items:</i></p> <ul style="list-style-type: none"> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater <p>2) If the value is higher than 1.25:</p> <ul style="list-style-type: none"> ① fuel system pressure too low ② fuel injector blocked ③ O2 sensor /heater failure ④ catalytic system leakage <p><i>Please check the following items:</i></p> <ul style="list-style-type: none"> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater
08	A	10~60	<p>A: steps for idle speed control valve N71</p>
	B	81~111°C	<p>B: coolant temperature</p>

			C: Lambda control value (cylinder 1~3) 1) if the value is lower than 0.75: ① fuel system pressure too high ② fuel injector leakage ③ O2 sensor /heater failure <i>Please check the following items:</i> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater 2) If the value is higher than 1.25: ① fuel system pressure too low ② fuel injector blocked ③ O2 sensor /heater failure ④ catalytic system leakage <i>Please check the following items:</i> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater
C	0.75~1.25		

	D	0.75~1.25	<p>D: Lambda control value (cylinder 4~6)</p> <p>1) If the value is lower than 0.75:</p> <ul style="list-style-type: none">① fuel system pressure too high② fuel injector leakage③ O2 sensor /heater failure <p><i>Please check the following items:</i></p> <ul style="list-style-type: none">① check fuel pressure and holding pressure② check fuel injector③ check O2 sensor or O2 sensor heater <p>2) if the value is higher than 1.25:</p> <ul style="list-style-type: none">① fuel system pressure too low② fuel injector blocked③ O2 sensor /heater failure④ catalytic system leakage <p><i>Please check the following items:</i></p> <ul style="list-style-type: none">① check fuel pressure and holding pressure② check fuel injector③ check O2 sensor or O2 sensor heater
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09	A	81~111°C	A: coolant temperature If the coolant temperature is higher than 111°C, the coolant temperature sensor or circuit is defective.
	B	0: OFF 1: ON	B: idle switch status
	C	6~12 ° BTDC	C: ignition angle If the value is out of the range, please check the following items: ---Electric applications ---Adjust power steering to middle position ---Air leakage
	D	680~820rpm	D: idle speed 1) If idle speed is higher than 820rpm: ①idle switch F60 defective ②air leakage, check intake air system ③idle speed control valve N71 fault 2) If idle speed is lower than 680rpm: ①idle speed control valve N71 fault ②idle switch F60 defective
	10	A	81~111°C A: coolant temperature

	B	0: OFF; 1: ON	B: idle switch status
	C	0.75~1.25	<p>C: Lambda control value (cylinder 1~3)</p> <p>1) If the value is lower than 0.75:</p> <ul style="list-style-type: none"> ① fuel system pressure too high ② fuel injector leakage ③ O2 sensor /heater failure <p><i>Please check the following items:</i></p> <ul style="list-style-type: none"> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater <p>2) If the value is higher than 1.25:</p> <ul style="list-style-type: none"> ① fuel system pressure too low ② fuel injector blocked ③ O2 sensor /heater failure ④ catalytic system leakage <p><i>Please check the following items:</i></p> <ul style="list-style-type: none"> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater

	D	680~820rpm	D: Idle speed 1) If idle speed is higher than 820rpm: ①idle switch F60 defective ②air leakage, check intake air system ③idle speed control valve N71 fault 2) If idle speed is lower than 680rpm: ①idle speed control valve N71 fault ②idle switch F60 defective
11	A	680~820rpm	A: Idle speed 1) If idle speed is higher than 820rpm: ①idle switch F60 defective ②air leakage, check intake air system ③idle speed control valve N71 fault 2) If idle speed is lower than 680rpm: ①idle speed control valve N71 fault ②idle switch F60 defective

	B	MAP	B: Intake air manifold absolute pressure 100% = 1022 Pa or Hg? 32% = 327 Pa or Hg? 29~59%: at idle speed
	C	81~111°C	C: coolant temperature If the coolant temperature is higher than 111°C, the coolant temperature sensor or circuit is defective.
	D	Lambda control	D: ON: Lambda active OFF: Lambda inactive
99	A	680~820rpm	A: idle speed 1) If idle speed is higher than 820rpm: ①idle switch F60 defective ②air leakage, check intake air system ③idle speed control valve N71 fault 2) If idle speed is lower than 680rpm: ①idle speed control valve N71 fault ②idle switch F60 defective
	B	Engine load (Actual value)	B: intake air manifold absolute pressure 100% = 1022 Pa or Hg? 32% = 327 Pa or Hg? 29~59%: at idle speed

	C	81~111 °C	C: engine coolant temperature If the coolant temperature is higher than 111 °C, the coolant temperature sensor or circuit failure.
	D	-10~+10%	D: Lambda control

7.5 Lambda control table

Value	Lambda Control Status	Reason and Remedy
0	---	ACF not work
1	Coolant temperature too low	Not reach engine coolant temperature 85 °C
		Read fault code
		Check coolant temperature sensor G62
4	Idle speed too low	Close all electric applications
		Read fault code
		Check idle speed
5	Idle speed too high	Read fault code
		Check idle speed
6	O2 sensor not work	Read fault code
		Check O2 sensor
7	Lambda control fault	not reach engine coolant temperature 85 °C
		Read fault code
		Check throttle potentiometer
10	Not reach the set value	not reach engine coolant temperature 85 °C
		Read fault code

11	Ignition count too few	Read fault code O2 sensor defective
12	Ignition count too much	Read fault code O2 sensor defective
16	ACF not work	

7.6 Weights and measures

The metric system

Metric	GB & US
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Length

10 mm	= 1 centimetre	= 0.3937 inch
10 cm	= 1 decimetre	= 3.937 inches
10 dm	= 1 metre	= 1.0936 yards =3.2808 feet
1000 m	= 1 kilometre	= 0.6214 mile
1852 m	= 1 mile marin	= 1.1500 miles

Surface

100 square metres	= 1 are	= 119.6 sq.yards
100 acres	= 1 hectare	= 2.471 acres
100 hectares	= 1 square kilometre	= 0.386 sq.mile

Weight

10milligrams (mg)	= 1 centigram (cg)	= 0.154 grain
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10 centigrams	=	1 decigram	=	1.543 grains
(cg)				
10 decigram	=	1 gram	=	15.43 grains
10 grams	=	1 decagram	=	5.64 drams
100 grams	=	1 hectogram	=	3.527 ounces
1000 grams	=	1 kilogram	=	2.205 pounds
1000kilograms	=	1 tone	=	19.688 hundredweight

Capacity

1000 millitres	=	1 litre (l)	=	1.76 pints (2.1US pints)
(ml)				
10 litres	=	1 decalitre (dl)	=	2.2 gallons (2.63 US gallons)

Avoirdupois Weight

GB&US		Metric
	= 1 grain (gr)	= 0.065 gram (g)
437.5 grains	= 1 ounce (oz)	= 28.35 grams
16 drams (dr)	= 1 ounce	= 28.35 grams
16 ounces	= 1 pound (lb)	= 0.454 kilogram (kg)
14 pounds	= 1 stone (st)	= 6.356 kilograms
2 stone	= 1 quarter	= 12.7 kilogram
4 quarters	= 1 hundredweight	= 50.8 kilograms
112 pounds	= 1short hundredweight	= 45.4 kilograms
20	= 1 ton	= 1016.04 kilograms

hundredweight

2000 pounds	=	1 short ton	=	0.907 tonne
2240 pounds	=	1 long ton	=	1.016 tonnes

Linear Measure

GB&US		Metric
	1 inch	= 25.4 millimetres
12 inches	= 1 foot	= 30.48 centimetres
3 feet	= 1 yard	= 0.914 metre
5.5 yards	= 1 rod,pole or perch	= 5.029 metres
22 yards	= 1 chain	= 20.17 metres
220 yards	= 1 furlong	= 201.17 metres
8 furlongs	= 1 mile	= 1.609 kilometres
1760 yards	= 1 mile	= 1.609 kilometers
3 miles	= 1 league	= 4.828 kilometres

Square Measure

GB&US		Metric
	1 square (sq) inch	= 6.452 sq centimetres
144 sq inches	= 1 sq foot	= 929.03 sq centimetres
9 sq feet	= 1 sq yard	= 0.836 sq metre
484 sq yards	= 1 sq chain	= 404.62 sq metres
4840 sq yards	= 1 acre	= 0.405 hectare
40 sq rods	= 1 rood	= 10.1168 ares
4 roods	= 1 acre	= 0.405 hectare

640 acres = 1 sq mile = 2.59 sq kilometers or 259 hectares

Cubic Measure

GB&US		Metric
	1 cubic inch	= 16.39 cu centimetres
1728cu inches	= 1 cu foot	= 0.028 cu metre
27 cu feet	= 1 cu yard	= 0.765 cu metre

Measure of Capacity

GB		US	Metric
4 gills	= 1 pint (pt)	= 1.201 pints	0.568litre
2 pints	= 1 quart (qt)	= 1.201 quarts	1.136litres
4 quarts	= 1 gallon (gal)	= 1.201 gallons	4.546litres

Pressure Measure

GB&US	Metric
1 pound per square inch(psi)	= 6.89 Kilopascal (KPa)
1 atmosphere(atm)	= 101 Kilopascal (KPa)
1 ton per square inch(ton/in ²)	= 15.4 megapascal(MPa)
1 millibar(mb)	= 0.0295 inch of mercury(in Hg)
1 inch of mercury(in Hg)	= 33.9 millibar(mb)

Velocity

GB&US	Metric
1 mile per hour(mph)	= 1.61 Kilometre per hour(km/h)

1 knot(kn) = 1.85 Kilometre per hour(km/h)

Temperature Equivalents

	FAHRENHEIT	CELSIUS OR CENTIGRADE
	(F)	(C)
Boiling-point	212°	= 100°
	194°	= 90°
	176°	= 80°
	158°	= 70°
	140°	= 60°
	122°	= 50°
	104°	= 40°
	86°	= 30°
	68°	= 20°
	50°	= 10°
Freezing-point	32°	= 0°
	14°	= -10°
	0°	= -17.8°
Absolute Zero	-459.67°	= -273.17